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Development and Evaluation of Diagnostic Support Aids for Upper Limb Disorders

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The Health and Safety Executive (HSE) required a prototype diagnostic support aid for upper limb disorders (DSAID-ULDs) to be evaluated scientifically in relation to its practical effectiveness and developed for publication. There were two parts to the project; an evaluation of the draft DSAID-ULDs for general practitioners (GPs), and, the development and evaluation of the DSAID-ULDs for occupational physicians (OPs).

The first experimental studies showed that both the OPs and GPs reached more accurate diagnoses using the DSAID-ULDs (or AID). This was demonstrated by statistically significant increases in the percentage of correct diagnoses at the expense of incorrect and undecided diagnoses. The field study showed that both GPs and OPs found the AID to be reasonably effective with increased diagnostic accuracy (especially for those seeing fewer complaints) and more informed decision making and usability being perceived as high. The final experimental study showed that the doctors who used the AID made considerably more correct and fewer wrong diagnoses than those without. Although the small study group sizes limit the generality of the findings, it can be concluded overall that the AID appears to help both GPs and OPs to improve diagnostic accuracy (especially for certain conditions), and make many fewer incorrect diagnoses. The improved levels of diagnosis are consistent with theoretical expectations which suggest that providing support for human memory, attention and training can be beneficial.

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EXECUTIVE SUMMARY AND CONCLUSIONS

SUMMARY

The Health and Safety Executive (HSE) supported the development of a draft form of an aid to help General Practitioners (GPs) in initial diagnostic assessment of Upper Limb Disorders. An improved diagnostic approach can reduce the far reaching, and potentially costly, consequences for employer and employee, both in terms of treatment and legal issues. The purpose of the aid was to guide GPs through alternative diagnoses and help them to examine possible causal factors, including work, before deciding on a management approach. With the time limitations imposed upon GPs, the aid was designed to be relatively simple, practical and easy to use.

The HSE required the prototype Diagnostic Support AID for ULDs (DSAID-ULDs) or AID to be evaluated scientifically in relation to its practical effectiveness and developed for publication. In addition, because the material prepared in the flowcharts and checklists was potentially of use to Occupational Physicians (OPs) in their diagnosis of ULDs, the HSE required this material to be further developed and a scientific evaluation undertaken.

There were essentially two separate but related parts to the project;

a) the evaluation of the draft AID for GPs, and,

b) the development and evaluation of the detailed diagnostic flowcharts and/or checklists as a AID for use by OPs

The initial and final experimental studies required the simulation of consultations with Standardised Patients (SPs) so that doctors could test the performance of the AID. In addition there was a need to develop material for the OP AID.

A methodology for using SPs had to be developed. The results from the study to develop the SP methodology showed that a paper-based self-training package could be used to train SPs to take part in simulated consultations where the doctors knew they were dealing with actors. Each actor was able to learn two cases and was able to rehearse each case at least three times from memory. The SPs training package enabled direct teaching to be minimised and demonstrated that it was able to provide the basis for a successful methodology.

Initially a prototype GP AID was available but additional information was needed to help OPs to undertake a more comprehensive diagnosis. A literature review to identify the needs and requirements of OPs showed there was very little covering the experience of OPs diagnosis of ULDs and subsequent requirements. The evidence suggested that OPs would find an AID of considerable use and that anecdotal evidence needed to be sought regarding OPs perceptions of the usability to complement evidence from the scientific literature. Further views of OPs and expert opinion were used to develop supplementary information to help in a more detailed diagnosis.

The diagnostic criteria were updated and extended to include the shoulder and neck by comparing the original diagnostic criteria with Harrington's 1998 surveillance criteria to bring these in line with the latter.

The first experimental stage involved a study of the respective AIDs using 10 OPs and 11 GPs under simulated consultations. The overall results from the study showed that both versions of the AIDs improved diagnoses. Both OPs and GPs reached more accurate diagnoses using the AID, with statistically significant increases in the percentage of correct diagnoses. This was at the expense of incorrect and undecided diagnoses.

In addition, it was shown that both samples of doctors had greater difficulty diagnosing certain types of disorders, particularly non-specific syndromes. This implied that there was greater need to provide diagnostic support for these types of conditions. These findings were used to help in prioritising changes to the AID, in order to target support for diagnosis where it was most needed.

In the second stage, doctors were asked to use the AID during normal consultations. Sixty eight OPs and 123 GPs were sent copies of the AIDs to use in their practices for an eight week period. Thirty three OPs and 33 GPs used it in their practices during an eight-week period.

Evaluation forms were completed each time the AID was used and a questionnaire filled in at the end each doctor's field trial period. The results from both sets of doctors showed that there was an acceptable level of agreement that the AID led to more accurate and more informed diagnoses. There was also substantial agreement that the AID was useful for judging work-relatedness of a condition, and had influenced the clinician's management plan. There was a good level of agreement that the AID was not difficult to use and took an acceptable amount of time to use. Recommendations for minor improvements to the AID and training package were generated.

At a practical level, the AID was perceived as generally good for non-specific disorders, with the perceived accuracy and information provided for diagnosis being higher than for hand/wrist problems. This finding was especially encouraging for its potential to help GPs because non-specific problems appear to form an important issue in diagnosis of upper limb complaints.

The findings also indicated that the perceived usefulness of the AID varied according to GPs levels of experience of diagnosis. The AID was helping to support those not routinely exposed to these conditions who were not able to acquire and maintain knowledge and skills in this area. In contrast to the GPs, those OPs seeing more upper limb complaints were more likely to perceive the AID helped them to reach a more accurate diagnosis, and more likely to find the AID not difficult to use.

In both studies, the sample size of OPs and GPs was relatively small and the participants could be viewed as being self selected, and so not necessarily representative of all GPs and OPs. During the field study, however, there were 285 and 264 consultations undertaken by GPs and OPs respectively. The number of conditions which were seen increases confidence in the generality of the

findings. It can be concluded, therefore, that using an approach based on the AID could be helpful to both GPs and OPs in improving diagnostic accuracy with fewer incorrect diagnoses. In addition, the AID was perceived to be helpful under operational conditions. Further, the type of information obtained appeared consistent.

Recognising the time limitations imposed upon GPs, the findings appear to indicate that the objective, of keeping the aid relatively simple, practical and easy to use, had been achieved. At a practical level, if a similar result could be obtained from the majority of consultations in the UK, this increase in diagnostic effectiveness could have a major impact on the number of conditions mis-diagnosed.

The final stage of the project was an experimental study designed to confirm whether the latest version of the AID continued to help in diagnosis of conditions. This used 7 OPs and 15 GPs recruited from the Scottish central belt and Grampian area. The sample size was obtained from around 50 OPs and 700 GPs invited to take part. Although the sample size was low and the generality of the findings limited, the results were encouraging.

A comparison between the diagnoses produced by the matched experimental and control doctors (for both OPs and GPs), showed the following. The doctors who used the AID made considerably more correct diagnoses (85.0%) than those without (54.5%), which was statistically highly significant. In addition, doctors who used the AID made under half as many wrong diagnoses (11.7%) than those who worked without the AID (28.3%).

Doctors who used the AID felt it was effective. All these doctors felt it led them to a more informed diagnostic decision, and three quarters felt that it helped them reach a more accurate diagnosis. In addition, doctors confirmed the AID's usability, since no doctor found the AID difficult to use and three quarters felt that the time taken to use it was acceptable. Although the small study group sizes limits the generality of the findings, the trends observed in the earlier stages of the project were supported by this study, i.e. the AID was perceived as helpful in actual consultations, as well as providing statistically significant evidence generally supporting the usefulness of the AID.

From this study, therefore, it can be concluded that the AID seems to be helpful to both GPs and OPs in improving diagnostic accuracy with fewer incorrect diagnoses. These results are consistent with theoretical expectations which suggest that providing support for human memory, attention and training can be beneficial.

Overall, the project showed that the AID appears to have the potential for improving diagnostic accuracy for both GPs and OPs, with fewer incorrect diagnoses. Further, it appears that the time taken to use it could be acceptable in practice.

Informal feedback from participants indicated that the AIDs provided a useful basis for training. This has implications for the training of both Ops and GPs. The fact that it was possible for both GPs and OPs to learn how to use it by means of a paper based training package provides a flexible means of delivery. It is clear that

the AID could be developed to train medical students and used as a means to improve practitioner skills, either by didactic or self learning. The latter could be by distance learning.

Decisions now need to be made about the final form of the AID. Further, some of the design recommendations suggested in the field trials need to be reviewed as part of this process.

CONCLUSIONS

1 A paper-based self-training package could be used to train Standardised Patients to take part in simulated consultations where the doctors knew they were dealing with actors

2 The Standardised Patients training package could enable direct teaching to be minimised and demonstrated that it was able to provide the basis for a successful methodology

3 The first experimental study was helpful in the development of the AID because it showed that;

a) the AID was significantly effective in increasing the number of correct diagnoses for both OPs and GPs at the expense of incorrect and undecided diagnoses

b) the majority of OPs felt they had benefited in some way from using a standardised approach to the diagnosis of ULDs, while the majority of GPs felt the AID had helped them diagnose the more uncertain or less obvious syndromes

c) the AID provided useful support for diagnosing the two diffuse syndromes for both OPs and GPs, as well as rotator cuff tendonitis for OPs, and arthritis and frozen shoulder for GPs

d) the design of the AID could be changed to improve it’s usability

e) both samples of doctors had greater difficulty diagnosing certain types of disorders, particularly non-specific syndromes and rheumatoid arthritis implying greater need to provide diagnostic support for these conditions

4 The second stage, where doctors applied the AID during normal consultations for an eight week period, provided information on practical issues, including perceived usability, by showing;

a) both sets of doctors had an acceptable level of agreement that the AID led to more accurate and more informed diagnoses

b) there was substantial agreement that the AID was useful for judging work-relatedness of a condition, and influenced the clinician’s management plan

c) a good level of agreement that the AID was not difficult to use and took an acceptable amount of time to use

d) that the AID was perceived to be helpful in operational conditions despite the relatively small sample size

5 The final experimental study showed the effectiveness of the AID for both OPs and GPs who used it, by showing that;

a) they made considerably more correct diagnoses (85.0%) than those without the AID (54.5%) which was highly significant (p=0.00000)

b) they made under half as many wrong diagnoses (11.7%) than those without the AID (28.3%)

c) they all felt the AID led them to a more informed diagnostic decision

d) three quarters of them felt that it helped them reach a more accurate diagnosis

e) the AID's usability was confirmed since no doctor found the Aid difficult to use

f) three quarters felt that the time taken to use it was acceptable

6 Overall, the AID appears to have the potential for improving diagnostic accuracy for both GPs and OPs, with fewer incorrect diagnoses. Further, it appears that the time taken to use it could be acceptable in practice.

7 With the time limitations imposed upon GPs, the findings appear to indicate that the objective, of keeping the aid relatively simple, practical and easy to use, had been achieved.

8 If a similar result using the AID could be obtained through the majority of consultations in the UK, the increase in potential diagnostic effectiveness could have a major impact on the number of conditions mis-diagnosed

9 With improved diagnostic accuracy there will be a need to focus on improving the management of conditions, especially those which are non specific

10 It is clear that the AID could be developed to train medical students and used as a means to improve practitioner skills, either by didactic or self learning, including distance learning

11 Studies such as this one, which depended upon volunteers from working GP and OP populations, face recruitment challenges which will need to be addressed in future studies, perhaps by co-ordination at a national level.

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1. INTRODUCTION

1.1 BACKGROUND

The Health and Safety Executive (HSE) supported the development of a draft form of an aid to help General Practitioners (GPs) in initial diagnostic assessment of Upper Limb Disorders (Sinclair et al., 1996). The purpose of this aid was to guide GPs through alternative diagnoses and help them to examine possible causal factors, including work, before deciding on a management approach. An improved diagnostic approach could reduce the far reaching, and potentially costly, consequences for employer and employee, both in terms of treatment and legal issues (see Davis, 1995).

A group of Occupational Physicians (OPs) and GPs provided expert opinion during the development of the aid. Alternative approaches involving diagnostic flowcharts and checklists were developed and an extensive background literature search was undertaken during the project. The final prototype version consisted of two parts providing a decision support in relation to diagnosing hand, wrist and forearm conditions (see Appendix 1). The first part provided an aide memoire to help with taking the history as it was recognised that it would not be possible to help with the examination per se. The second part was designed to lead the physician through a series of decision points based upon the history and observation of symptoms. Recognising the time limitations imposed upon GPs, it was felt to be important to keep the aid relatively simple, practical and easy to use.

During the project, feedback from the Occupational Physicians indicated that these diagnostic flowcharts and checklists would be of value to their colleagues in obtaining a clearer diagnosis and management of work related causal factors. Beyond these views, there was additional evidence that OPs could benefit from a standardised approach to the diagnosis of ULDs. Cooper and Baker (1996) reported a lack of standardised methods of labelling, clinically evaluating, and treating ULDs which had consequences for Occupational Physicians since these disorders were among the most common reasons for attending OPs. Cooper and Baker (op cit.) called for an appropriate means of classifying and treating ULDs, and made suggestions regarding important aspects of the clinical evaluation.

Further, Diwaker and Stothard (1995) conducted a study which showed considerable differences of opinion amongst groups of medical experts concerning the meaning, labelling, and diagnosis of tenosynovitis and repetitive strain injury (RSI). They found that there were variations of interpretation within the group of six Occupational Physicians who took part in the study. In particular, four OPs believed RSI to be a genuine condition and two did not.

The HSE required the prototype Diagnostic Support Aid for ULDs (DSAID-ULDs) to be evaluated scientifically in relation to its practical effectiveness and developed so that it could be taken forward to publication. In addition, because the material prepared in the flowcharts and checklists was potentially of use to Occupational Physicians in their diagnosis of ULDs, the HSE required this material to be further developed and a scientific evaluation undertaken. This report describes the results of this project.

The next sub-section provides a short discussion of the thinking behind the design of the project.

1.2 PROJECT DESIGN

There were essentially two separate but related parts to the project;

a) the evaluation of the draft DSAID-ULDs for GPs, and,

b) the development and evaluation of the detailed diagnostic flowcharts and/or checklists as a DSAID-ULDs for use by Occupational Physicians

Throughout the report, the term DSAID-ULDs has been shortened to AID in order to improve readability.

Although a prototype document forming the AID for GPs was available at the end of the previous project, this needed to be developed for OPs and evaluated objectively for both groups. An important issue was the need to determine whether GPs/ OPs improved their performance by using the AID. The only way this could be achieved within the timescales and resources of the project was by ensuring that GPs/ OPs performance was assessed while they used the AID during consultations undertaken under controlled conditions.

Using real patients was likely to involve practical and ethical problems, so it was argued that using people who were able to simulate specified medical conditions would be the best compromise in the circumstances. The first set of experimental studies was designed, therefore, to measure performance with and without the AID and identify any improvements prior to a more widespread evaluation.

In addition to user performance measures, there were practical and acceptability issues which needed to be addressed. It was decided that information about the latter should be obtained by carrying out larger trials under operational conditions (field trials). This would involve inviting GPs and OPs to participate to obtain samples, initially set provisionally at 50 and 30, respectively. The samples would be sent the respective draft AIDs to use within their practices while examining upper limb complaints. For logistic reasons, it was accepted that the information obtained would depend upon respondents perceptions which would need to be obtained by questionnaire.

Once the data from the field trials had been analysed, it was felt important to make changes to the AID to reflect user's practical issues and carry out a final experimental evaluation. The reasoning behind this was that there was a need to confirm that the final version of the AID, having been modified to take account of practical needs, still provided improvements in performance.

Although the studies for GPs and OPs were carried out separately, inevitably there were overlaps between the two parts, for example, in the use of Standardised Patients. The next sub-sections provides more detail on the project and its aims.

1.3 PROJECT AIMS

1.3.1 Evaluation of the draft AID for GPs

The aims of this part of the study were to:

a) assess the usability of the draft AID in its present form
b) assess GPs' perception of the draft AID in terms of its effectiveness
c) identify and implement necessary changes and material to be added to the draft AIDs, based upon the assessments
d) evaluate the effectiveness of the AID in fulfilling its purpose.

1.3.2 Development and evaluation of an AID for Occupational Physicians

The aims of this part of the study were to:

a) complete the initial development of a draft AID for Occupational Physicians
b) assess the usability of the draft AID
c) assess the Occupational Physicians' perception of the AID in terms of effectiveness
d) identify and implement necessary changes and material to be added to the draft AID, based upon the assessments
e) evaluate the effectiveness of the Occupational Physicians AID in fulfilling its purpose.

1.4 PROJECT OVERVIEW

1.4.1 Project Group

A Project Steering Group was set up with representatives from the HSE, and the disciplines of Occupational Medicine, Rheumatology, General Practice and Ergonomics. The remit of this group was to agree a detailed study plan covering each of the study objectives, to assist in specific steps in the execution of the study, and to review the progress of the study at regular intervals.

It was felt important that an independent view be obtained on the progress of the project. To this end a meeting was held on completion of the initial experimental evaluation and prior to the field studies. This allowed a range of officials from the Health and Safety Executive and from other Government Departments to be briefed on, and comment on the project.

1.4.2 Symptom Cases and Standardised Patients

Patient histories were selected with the help of the Project Steering Group in order to construct symptom cases to provide a representative coverage of the material contained within the documents constituting the AID. These histories were obtained with the assistance of a GP/ Rheumatologist. Patient histories were then examined by the Project Steering Group and produced in the form of detailed symptom cases.

Standardised Patients (SPs) were selected to represent the symptom cases. Each

SP was trained until he/she could present the details of a number of specific symptom case (history and physical characteristics), under conditions similar to a consultation. The Project Steering Group were required to assess the standard of each SP's presentation prior to the SP being used in a particular element of the study.

1.5 EVALUATION OF THE DRAFT AID

1.5.1 Overview of GPs Study

The draft AID was evaluated initially among a sample of GPs under experimental conditions, and in a wider field study, in order to determine whether the information presented in the aid was of practical use, both in terms of its content and presentation. In addition, any practical needs of GPs not met by the draft AID was to be identified. Finally an experimental study of the modified AID was undertaken using a small group of subjects.

1.5.2 Overview of OPs Study

As the draft AID documents were not at the same stage as the GPs, the researchers had to develop material prior to the initial experimental study. This was done with the help of the Project Steering Group (see Section 2.9).

The AID was evaluated initially among a sample of OPs under experimental conditions, and in a wider field study, in order to determine whether the information presented in the AID was of practical use, both in terms of its content and presentation. In addition, any practical needs of OPs not met by the draft AID was identified. Finally an experimental study of the modified AID was undertaken using a small group of subjects.

1.6 REPORT STRUCTURE

The main report is divided into four main sections. Section 2 describes the work undertaken to develop the protocol using standardised patients and to update the diagnostic criteria, and produce the extra material for the OPs AID. The next, Section 3, describes the studies undertaken during the first set of separate experimental studies to evaluate scientifically the practical effectiveness of the respective prototype AIDs for GPs and OPs.

Section 4 describes the work carried out during each of the field studies undertaken during the evaluation of the modified draft AIDs for GPs and OPs. Section 5 describes the final set of experimental studies undertaken to evaluate scientifically the practical effectiveness of the respective prototype AIDs for GPs and OPs. As will be seen, the data from these studies were combined because of practical difficulties in obtaining the target number of subjects. The overall results and implications for the general application of the finalised AIDs are discussed in Section 6.

2. DEVELOPMENT, IMPLEMENTATION AND EVALUATION OF STANDARDISED PATIENT TRAINING AND UPDATE/ DEVELOPMENT OF OP AID

2.1 INTRODUCTION

2.1.1 General

The initial and final experimental studies required the simulation of consultations with patients so that doctors could test the performance of the Diagnostic Support Aids for ULDs (DSAID-ULDs) or AID. In addition there was a need to develop material for the OP AID. This section discusses the development of the standardised patient methodology and the approach taken to diagnostic criteria updating and producing additional material for the OP AIDs. These activities were undertaken in parallel to a certain extent. Clearly the diagnostic criteria had to be finalised before completing the Standardised Patients Methodology.

2.1.2 Standardised Patients Methodology

In order to ensure a robust experimental methodology for these stages, it was necessary to standardise a number of factors in relation to the consultations, the most important of these being the symptoms presented by the patients. Beullens et al. (1997) describe the “Standardised Patient” as a healthy subject or an actual patient who has been trained to present accurately and consistently a particular case and to report or judge the behaviour of the physician based on fixed criteria. Beullens et al. (op cit.) stated that the Standardised Patient (SP) technique is usually used only for the first contact with the patient. Therefore this method is appropriate in the context of the overall project, which is concerned with evaluating an aid for supporting decisions involved in diagnosing Upper Limb Disorders.

The use of real patients presenting actual symptoms was considered to be inappropriate due to ethical issues, as well as the practical and logistical difficulties inherent in obtaining the services of such patients for a number of trials. It was decided, therefore, that training actors would be appropriate to present standardised symptom cases for the purposes of the project.

Buellens et al. (op cit.) indicate that the validity of data produced using SPs is increased when the practitioner believes he or she is presented with a real patient, i.e. the practitioner’s behaviour is unaffected. They state that the likelihood of this is a function of the credibility of the presentation. However, in a study of the use of SPs, Kinnersley and Pill (1993) stressed that the importance of the practitioner following normal behaviour depends on the specific aim of the project. In the context of the current project, which was more concerned with measuring the ability of doctors to use a diagnostic aid than with their normal day-to-day practice, it was accepted that ‘normal behaviour’ was not a primary concern. As with the study by Kinnersley and Pill (op cit.), the doctors were informed that the study was using actors as SPs, but were not told about the content of the cases.

It was considered important, however, to make the presentation of the SPs as credible as possible, to allow doctors to follow their normal mode of behaviour as

far as possible in the given circumstances. Issues that affect the credibility of presentation include: match with real patients in age and gender; realistic presentation of attitude and affect of actual patients (Woodward et al., 1985); and the tendency for SPs to be more assertive than real patients (Kinnersley and Pill, op cit.).

In total, ten specific symptom cases required to be presented by SPs for the overall project. One disadvantage of the SPs method highlighted by Buellens et al. (op cit.) was that it requires a lot of time for selection and training of actors. However, in a study by Woodward et al. (op cit.) it was found that two to three sessions of case presentations were sufficient to obtain better than 90% agreement between SP and observer. In addition, Russell et al. (1991) noticed that the inter-patient reliability agreement between different SPs increased over time from 79% in the initial session to 91% in the fourth session. Due to practical constraints (i.e. time, resources allocated, and logistics), the training of SPs required to be carried out using paper-based self-training packages.

2.2 STUDY AIMS

The aims of this study were to:

a) produce a self-training package to help actors learn to play the parts of SPs
b) administer the packages, with the provision of all necessary teaching support
c) evaluate the presentation of symptoms by actors under simulated medical assessment conditions

The overall objective was to produce a set of 10 SPs who would produce an appropriate standard of performance for the simulated consultations involved in the main project.

2.3 METHODS

2.3.1 Case History Development

2.3.1.1 Syndrome selection

The Project Steering Group (PSG) consisted of an Employment Medical Advisor, an Occupational Physician (OP), a General Practitioner (GP)/ Rheumatologist and three Ergonomists. A consensus of the PSG determined that ten syndromes would be useful for testing the AID (see Section 2.9), and would be developed into standardised case histories to be presented by SPs in the simulated consultations. The ten syndromes were:

1. Flexor Tenosynovitis of the wrist
2. Carpal Tunnel Syndrome
3. De Quervain’s disease
4. Lateral Epicondylitis
5. Shoulder Capsulitis (Frozen Shoulder)
6. Rotator Cuff (Supraspinatus) Tendonitis
7. Non-specific diffuse forearm pain
8. Cervical Spondylosis

9. Diffuse neck/shoulder pain
10. Rheumatoid Arthritis (monoarticular presentation)

These were selected on the basis that:

(a) they provided a representative coverage of common disorders from different areas of the upper limb included in the AID
(b) they included syndromes where clear surveillance criteria had been provided by a recent consensus study carried out by Harrington et al. (1998)
(c) the inclusion of Rheumatoid Arthritis should provide a test of a doctor's ability to undertake a challenging diagnosis and hence act as a "control".

2.3.1.2 Consultation and history proforma construction

In order to examine how symptom cases should be presented by SPs, it was necessary first to specify in clear terms the format of a consultation. This was done by the GP/Rheumatologist and the OP of the PSG. It involved specifying the overall structure of the consultation in terms of topics covered, and listing various questions which might be asked by the doctor when obtaining a patient history. Examples of these questions are given in Appendix 2.A. This made it possible to design case histories which would help the SPs to anticipate the types of answers they would be required to give in a consultation.

2.3.1.3 Symptoms

The PSG decided that the detail of the standardised case histories would include a maximum of two or three symptoms which a patient would volunteer to the clinician at the start of the consultation, as well as symptoms which would be communicated only in response to direct questioning from the clinician.

Symptom details of standardised case histories for each of the ten selected cases were drawn up in draft form by the PSG Rheumatologist. This involved consulting file notes on previous cases of the syndromes. Where necessary, the Rheumatologist also consulted colleagues to obtain detailed symptoms for less common syndromes. An effort was made to ensure that the symptoms were not entirely classical, so that the case histories would be more realistic, and the AID could be tested for its power to help the clinician abstract the most important information from a history.

According to Beullens et al. (op cit.), the case presentation by the SPs has to be accurate. They state that accuracy can be defined as the proportion of essential clinical features presented correctly in the consultation. Therefore, symptom details were classified by the PSG Rheumatologist and OP according to whether or not they were essential to the differential diagnosis. Essential symptoms were defined as those which are instrumental in guiding the clinician to a diagnosis. In this way, non-essential symptoms refer to those which are more incidental in nature. Such non-essential symptoms were included in the standardised case histories in order to provide character to the cases and make them more realistic.

The PSG decided that responses to a general systems review would not be included in each case history as this could increase its complexity. Nevertheless,

the doctors taking part in the overall project would not be constrained from conducting a general systems review during each consultation. For this reason, the SPs would be told to answer “no” or “nothing of note” when questioned on such issues.

2.3.1.4 Patient background

The PSG decided also that the background history for each case would be minimal and would be standardised across all test syndromes in order to allow the study to focus on variables of interest, i.e. effectiveness of aid in diagnosis and judgement of work-relatedness. The PSG OP and Ergonomists further developed the draft histories in order to produce standardised occupational backgrounds. These drafts were then circulated to members of the PSG until agreement was reached on their format and content.

2.3.1.5 Physical Examination

In addition, the PSG considered that the draft standardised case histories should be completed by detailing responses required in relation to physical examination tests. However, it was decided to be unlikely that this was a useful exercise, since physical examination is intended merely to confirm diagnoses made on the basis of symptoms, and the AID offers no support where confirmation is negative.

According to Beullens et al. (op cit.) one difficulty of using actors to play the roles of SPs is the limited range of symptoms and syndromes that can be simulated on physical examination. For this project, it was considered that it would be impossible to consolidate all the physical examination tests that might be undertaken in a consultation. Therefore, through discussion with the PSG’s GP/Rheumatologist and OP, it was decided that physical examination would not be included in the standardised case histories. For the overall study, this meant that doctors would be instructed that they should not conduct an examination for physical signs in the simulated consultations.

Finally, each case was illustrated using a body map to identify definitively the anatomical site of the symptoms to be presented. The full case histories are reproduced in Appendices 2.B and 2.C.

2.4 TRAINING PACKAGE DEVELOPMENT

2.4.1 Specification of performance requirements

The attributes of SPs required the simulated consultations to be explored by the PSG, in order to define the specific objectives of the self-training package, as well as the standard of knowledge and competence which actors needed to exhibit following training. The PSG decided that SPs would be assessed ultimately using the following criteria to identify any inconsistencies in the details of their symptom presentation from the standardised case histories;

a) 100% knowledge of essential symptoms
b) 50% knowledge of non-essential symptoms
c) says don’t know for unknown symptoms

It was also decided that the competence of the SPs would need to be evaluated subjectively in relation to indicators of realism. To incorporate a degree of objectivity in performance assessment, presentations were assessed by using a structured proforma based on the following behavioural aspects (see Woodward et al., 1985 and Russell *et al*., 1991).

a) patient does not present unlisted symptoms
b) no unintentional verbal hesitation (assessors would attempt to identify whether hesitation was part of the role-play or due to limited knowledge of symptoms)
c) eye contact kept minimal
d) body language uptight
e) assertiveness kept minimal

The structured proforma (see Appendix 2.D) formed the basis for developing the training package. This proforma was used in the assessment of trained SPs to ensure that the requirements of the simulated consultations were met.

2.4.2 Training Package Content

For reasons of practical constraints (i.e. time, resources allocated, and logistics), it was decided that the training would be carried out using paper-based self-training packages. In developing the package, the following issues were examined; what information needed to be imparted, how this should be presented and the level of training (i.e. number and length of practice sessions) required to raise the SPs presentation standard to an appropriate performance level. These issues were determined by examining the literature and through discussion with the PSG.

An introduction and set of instructions were included in all the self-training packages. The introduction included the background of the overall research and general details about the draft diagnostic AID. There were essentially two parts to the instructions. The first part was designed to direct the reader how to use the self-training package to learn and to practise presentation of the standardised case history included in the package.

The second part of the instructions gave details of the consultation procedure which would be followed during the simulated consultations and any specific actions which would need to undertaken. Initially, it was intended that these actions would include assessing the behaviour of the doctor. This would have taken the form of a post-consultation questionnaire (see Appendix 2.E). However, the PSG decided against this, since little additional relevant information could be obtained by this approach, and since it could be intimidating for the doctors to be assessed by their patients, leading to a change in their behaviour.

A role-play exercise was developed to incorporate the sample questions produced (Appendix 2.A) and the standardised case history. This formed a practice script which could be used to give the actor an opportunity to test and rehearse presentation of symptoms and signs. The role-play questions were then discussed with the PSG until agreement was reached on their format and content.

The issue of whether the actors should be provided with a prompt sheet to support their presentation during the consultation was discussed, but the PSG

decided this should not be used as it would detract somewhat from the realism of the simulated consultation.

2.4.3 Piloting of Training

The issues of training techniques and the required level of training were examined further by means of informally piloting the packages. This involved assessing the performance levels of four subjects at set stages during the training process. The structured proforma was used to test how much training (and possibly tutor support) was needed to meet the performance requirements of the initial experimental study. On the basis of these trials it was decided that the actors needed to be able to rehearse the presentation of a symptom case at least three times without the support of a script. It was also decided that actors did not need tutor support, although this would be made available if requested. The information in the package was changed to incorporate these findings at this stage. The completed packages were then circulated to members of the PSG, to agree final versions prior to implementation.

2.5 TRAINING

A pool of 17 actors was recruited by contacting local amateur drama groups. All actors attended an initial briefing session, at which each received a training package and was allowed to deal with any outstanding queries about the study. Each training package contained two specific symptom cases, chosen such that each of the ten SP parts could be played by at least two different actors. Actors were given approximately one week to learn their cases prior to their presentation being evaluated. It was made clear that the researchers could be contacted during this time to provide any teaching support that was needed.

2.6 STANDARDISED PATIENT EVALUATION

The SPs were then formally assessed by the OP and three ergonomists of the PSG. This was done using the structured proforma produced in Appendix 2.D, which was incorporated into a checklist evaluation sheet to be completed by each assessor for each SP.

Actors were paired for the assessment process and separate evaluation appointments were made for each pair. Each actor was required to present two standardised case histories by role-playing with their assigned partners, taking the respective roles of patient and examiner (the presentation of the medical examiner role was not assessed).

The assessors used the checklist evaluation sheet for each history to examine whether the training requirements set out prior to development had been fulfilled, as well as whether the presentation of symptoms and signs by each SP met an acceptable standard. This was aimed at assessing whether the paper-based postal self-training package approach was appropriate to provide the intended training.

Thirteen actors successfully completed the evaluation stage.

2.7 RESULTS

Parts one and two of the main body of the training package are given in Appendices 2.F and 2.G, respectively. Part One introduced the training package and explained how it should be used to learn the symptom cases. Part Two gave details of the procedure which would be followed during the simulated consultations and any specific actions which the actor would need to undertake.

Table 1 shows the performance of the 13 patients who were accepted for use in the study. It can be seen that, in all but one of the 26 presentations, the actors managed to present all of the essential symptoms. The actor who did not was required to undertake further training and evaluation.

Table 1
Proportion of symptoms correctly presented
by Standardised Patients during evaluation

Patient	**Disorder presented**	**Proportion of symptoms presented**	
*****		***Essential***	***Non-essential***
A	Flexor Tenosynovitis of wrist	100%	4 out of 6
A	Diffuse neck/shoulder pain	100%	4 out of 5
B	Non-specific diffuse forearm pain	100%	4 out of 6
B	Lateral Epicondylitis	100%	4 out of 6
C	Non-specific diffuse forearm pain	100%	6 out of 6
C	Supraspinatus Tendonitis	100%	5 out of 7
D	Flexor Tenosynovitis of wrist	100%	3 out of 6
D	Cervical Spondylosis	100%	5 out of 6
E	Carpal Tunnel Syndrome	100%	6 out of 7
E	Diffuse neck/shoulder pain	100%	3 out of 5
F	Non-specific diffuse forearm pain	100%	4 out of 6
F	Cervical Spondylosis	100%	5 out of 6
H	Rheumatoid Arthritis of wrist	100%	3 out of 4
H	Diffuse neck/shoulder pain	100%	3 out of 5
K	Rheumatoid Arthritis of wrist	100%	2 out of 4
K	Shoulder Capsulitis	5 out of 7 **	4 out of 6
L	De Quervain's disease	100%	3 out of 6
L	Shoulder Capsulitis	100%	4 out of 6
N	Rheumatoid Arthritis of wrist	100%	2 out of 4
N	Supraspinatus Tendonitis	100%	6 out of 7
O	De Quervain's disease	100%	5 out of 6
O	Cervical Spondylosis	100%	5 out of 6
P	Carpal Tunnel Syndrome	100%	6 out of 7
P	Lateral Epicondylitis	100%	6 out of 6
Q	Flexor Tenosynovitis of wrist	100%	5 out of 6
Q	Shoulder Capsulitis	100%	6 out of 6

* Patients G, I, J, M did not complete the evaluation stage of the training

** Actor was required to re-learn case and presented all essential symptoms at a second evaluation

In addition, all actors managed to present at least 50% of non-essential symptoms, as required to ensure that the SP was realistic. The omission of many non-essential symptoms may have occurred because the specific question relating to that symptom was not asked. Whatever the reason, actors' were made aware of the symptoms they had failed to report so that they would remember these symptoms in future consultations.

There were other criteria against which the actors were assessed. These included; knowing the part well enough to prevent unintentional hesitation and avoidance of presenting incorrect symptoms. In relation to the latter, if an actor did not know the answer to a question, they should not give an answer which could mislead the doctor. In the majority of consultations, the researchers were satisfied that patients answered 'don't know' to questions about unknown details. Also to increase realism, the behaviour of the actor needed to include uptight body language, minimal eye contact and minimal assertiveness. All actors were rated as satisfactory in all these areas.

2.8 CONCLUSIONS

The study showed that a paper-based self-training package could be used to train SPs to take part in simulated consultations where the study allows for doctors to know they are dealing with actors. Each actor learned two cases and was required to rehearse each case at least three times from memory. It is appreciated that for covert studies, which require doctors to believe that each patient is real, then training requirements are likely to be greater. Nevertheless, the current package enabled direct teaching to be minimised and was demonstrated to provide the basis for a successful methodology for the purposes of this project.

2.9 UPDATE AND DEVELOPMENT OF OP AID

2.9.1 Introduction

Prior to developing the SPs methodology there was a need to both update the knowledge on diagnosis of conditions and identify the needs of OPs so that these could be incorporated into the OP version of the AID. Further, there was a requirement by the HSE to extend the conditions originally used to include the shoulder and neck.

2.9.2 Determining OP Requirements

Appendix 2.H summarises the literature review undertaken to identify the needs and requirements of OPs in relation to the diagnosis of upper limb disorders. It was concluded that there was very little in the literature indicating the experience of OPs in relation to diagnosis of ULDs and any subsequent needs or requirements. The little evidence found suggested that OPs would find a decision aid to be of considerable use. It was concluded that it may be necessary to collect more anecdotal evidence regarding OPs perceptions of the usability of such an aid to complement information from scientific literature.

The approach taken, therefore, was to obtain further views of OPs and expert opinion from within the project group. The outcome of this process was the

development of supplementary information, designed to aid the OP.

2.9.3 Extension and Update of Diagnostic Criteria

As an extension to the current study, the HSE asked for the syndromes of the elbow and upper arm to be included in a diagnostic aid as well as those of the hand, wrist, and forearm. This had the advantage of covering a representative sample of common disorders from different areas of the upper limb within the AID.

Harrington et al. (1998), in a Delphi exercise, used a group of health care professionals from disciplines interested in the prevention and management of ULDs, to establish case definitions and surveillance criteria for several ULDs. It was agreed that inclusion of the Harrington consensus criteria in the current study could only serve to increase it's validity. This also had the advantage of allowing comparability with future studies which incorporated the Harrington consensus criteria.

It was decided that the ULD diagnostic criteria developed by Sinclair et al. (1997), should be compared with the surveillance criteria identified by Harrington et al. (op cit.). The first stage of the comparison was to collate both sets of criteria in tabular form. Next, the criteria were compared to identify any differences (see Appendix 2.I).

From this analysis several additions were required to the Sinclair et al. (op cit.) key criteria to bring these in line with the surveillance criteria identified by Harrington et al (op cit.). Syndromes covered by the AID which were affected included;

(i) Carpal Tunnel Syndrome
(ii) De Quervain's Tenosynovitis
(iii) Tenosynovitis/Tendinitis/Peritendinitis
(iv) Non-specific hand/wrist/forearm pain
(v) Frozen Shoulder
(vi) Bicipital Tendonitis

The criteria from the Harrington et al surveillance criteria which were added to the key criteria for the study were as follows;

a) "abnormal nerve conduction time" was added to the key criteria for Carpal Tunnel Syndrome

b) "reproduction of pain by resisted active movement of the affected tendons with the forearm stabilised" was added to the key criteria for Tenosynovitis

c) "pain reproduced by resisted thumb extension" was added to the key criteria for De Quervain's Tenosynovitis and "De Quervain's Disease" was adopted as the label

d) "Pain in the forearm AND failure to meet the diagnostic criteria for other specific diagnoses and pathologies" was added to the key criteria for non-specific hand/wrist/forearm pain and "non-specific diffuse forearm pain" was adopted as the label

e) "unilateral pain in the deltoid area and equal restriction of active and passive

glenohumeral movement in a capsular pattern (external rotation > abduction > internal rotation)" were added to the key criteria for Frozen Shoulder

f) "pain on resisted active flexion of the elbow" was added to the key criteria for Bicipital Tendonitis

The final stage of AID development involved detailed discussions with the project group Rheumatologist. The AID was re-drafted taking account of the modified ULD criteria and circulated to the Project Steering Group for final agreement.

3. EXPERIMENTAL STUDIES TO EVALUATE THE EFFECTIVENESS OF THE PROTOTYPE AID FOR GPS AND OPS

3.1 INTRODUCTION

3.1.1 Background

The first part of the research involved experimental studies designed to evaluate scientifically the practical effectiveness of the prototype AID. This was an important step in the developmental process, since it had the potential to reveal areas of the AID which might need added to, removed, or changed, so the AID could effectively support the practical decision making of GPs and OPs.

One of the techniques used in the study was Verbal Protocol Analysis (see Bainbridge and Sanderson, 1995). This is a method used by researchers to reveal the knowledge and cognitive processes used by a person while performing a task or behaviour. It is important to analyse all protocols since evidence suggests that useful protocols may be scarce but are very valuable (Rooden, 1998). The task of an OP or GP diagnosing ULDs fulfilled the criteria for the valid use of Verbal Protocol Analysis (VPA) set down by Byrne (1977).

It was decided that VPA would be a useful way to help assess the performance of the AID, on the basis that it has been used in what are known as user trials, to assess the effectiveness of a product and users' perceptions of it (Rooden, op cit.). This had the potential to assist in determining how the AID affected OPs or GPs decision making during the consultations and reveal aspects of the AID which could be changed to make it more usable.

There were similarities between the methods used in both the OP and GP studies. Where any details of the methods used in the two separate studies is different, these are described below.

3.1.2 Aims

The aims of the experimental studies were to:

a) complete the initial development of the draft diagnostic AID for the OPs
b) assess the effectiveness of the prototype AID for both GPs and OPs
c) assess GPs and OP's perceptions of the prototype AID in terms of its usability
d) identify and implement necessary changes and material to be added to the prototype AID, based upon these assessments

3.2 METHODS

3.2.1 Overview

Two separate studies were undertaken to evaluate how effectively the GP and OP AIDs supported their respective decision making. Actors playing the part of standardised patients were used for both studies. The latter were trained to play the part of standardised patients in experimental consultations (see Section 2).

Samples of GPs and OPs were obtained by local contact. For logistic reasons, the OPs and GPs learned to use the AID from a training package developed and evaluated informally prior to the trials. This training package was sent to them in advance of the trials and a briefing session held before the trials to confirm that they had read and understood the package. In principle, therefore, all participants should have been at the same level of knowledge in relation to the use of the AID.

A sample of 11 GPs were required to make use of the draft AID to diagnose 10 different Upper Limb Disorder case histories presented by standardised patients during 5 to 8 minute consultations. In the separate study, a sample of 10 OPs were required to make use of the draft AID to diagnose 10 different Upper Limb Disorder case histories presented by standardised patients during 10 minute consultations.

GPs and OPs were required to take the history of each patient by their usual approach. At this point they were asked to give an initial diagnosis. They were then required to complete the consultation using the diagnostic support AID and produce a final diagnosis on this basis.

The first 3 of the GPs used an older version of the AID which was similar to an AID designed for the use of OPs. Due to the fact that experimental trials of the OP AID had been completed, it was possible to make modifications to this version of the AID aimed at improving its usability. As a result, the next 8 GPs used the modified version of the AID in their experimental trials.

The GPs and OPs were asked to describe their thinking during the consultations which was tape recorded in preparation for VPA. After the consultations they were provided with a short questionnaire in order to record specific problems they had with the AID and form an overall impression of their perception of its usability and acceptability. The questions covered issues such as how the AID helped OPs to make decisions, how relevant the content was, how user friendly the format was, and how acceptable the AID was for use in practice. These questions were asked for each part of the AID in turn.

3.2.2 Using Verbal Protocol Analysis To Assess The Usability Of The AID

Verbal protocols were recorded on audio tape and then analysed to identify the diagnostic conclusions reached by the GPs and OPs and how the AID had influenced these. GPs and OPs' initial diagnosis before using, and final diagnosis after using the AID were recorded. This allowed an assessment of whether the AID effectively influenced their progress towards the correct diagnosis.

The tapes were listened to and comments relating to the GPs and OPs using the AID were extracted according to a set of criteria outlined on a proforma. These criteria included instances when the layout or content of the AID seemed to affect an OP's thinking, decision making, or questioning in some way. From the verbal protocol analysis it was possible to make changes to the AID aimed at improving its usability.

3.2.3 Statistical Analysis

Diagnoses were given ratings as follows:

wrong = 0; undecided = 1; right = 2.

It was therefore possible to provide rates of each GP or OP diagnosis for each of the ten case histories before and after use of the AID. It was assumed that one aim of the AID was to lead to correct diagnosis (2), which would be preferable to undecided diagnosis (1), which in turn would be preferable to incorrect diagnosis (0). On this basis the diagnosis ratings could be considered as ordinal data for the purposes of the analysis.

The following hypotheses were tested in order to assess the effectiveness of the AID:

a) There were significantly more correct diagnoses after GPs or OPs used the AID compared to before they use the AID

This was tested by comparing the mean diagnosis ratings before using the AID with the mean diagnosis ratings after using the AID with a Wilcoxon matched pairs t-test.

b) There were significant differences between the mean diagnosis ratings for each of the ten syndromes.

This was tested by comparing the mean diagnosis ratings for each syndrome using a Friedman repeated-samples analysis of variance test.

3.3 RESULTS

3.3.1 Effectiveness of the AID - GPs

Table 2 gives a descriptive indication of how effectively the 8 GPs who used the modified version of the AID were led to the correct diagnosis. It categorises GPs in terms of whether their initial and final diagnoses were either right, wrong, or undecided.

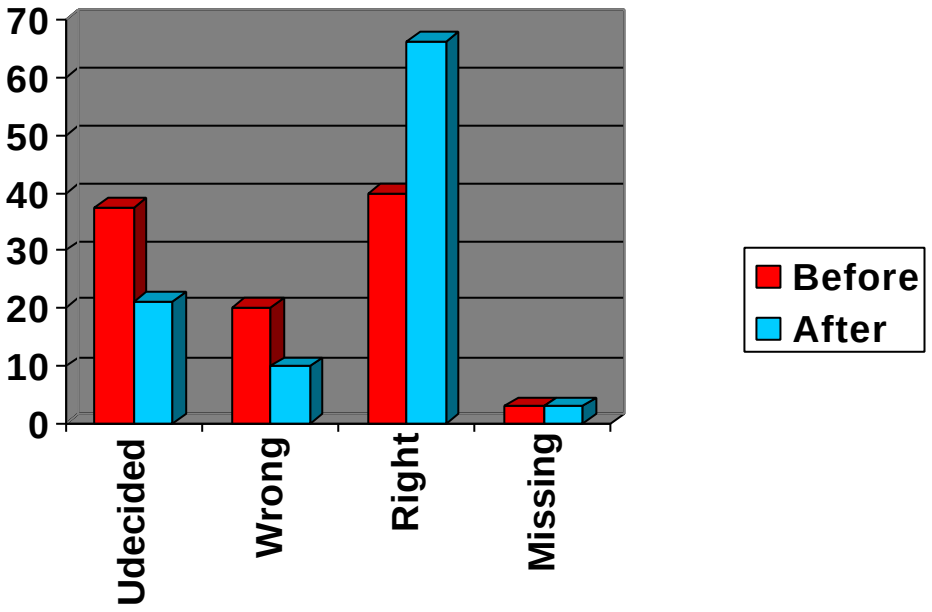
It can be observed that the AID seems to have most helped GPs diagnose cervical spondylosis. It also seems to have helped with the diagnosis of non specific diffuse forearm pain, arthritis and lateral epicondylitis.

From Table 2, it seems that the AID guided a considerable number of GPs to the correct diagnosis from initially being uncertain or incorrect. In addition, it appears the AID had been more helpful for diagnosing some syndromes compared to others. These hypotheses were tested for statistical significance in order to strengthen the initial findings.

The first hypothesis concerned whether, on average, there were significantly more correct diagnoses after the AID. Figure 1 shows that the number of correct diagnoses increased from 40% to 66.3% with use of the AID. This was

Table 2
GPs' diagnosis of each disorder in terms of initial and final diagnoses

DISORDER	Initial & final diagnosis correct	Initially uncertain /wrong to final diagnosis correct	Initial & final diagnosis uncertain/wrong	Initially correct to final diagnosis uncertain/wrong
Wrist flexor tenosynovitis	2	2	3	1
Carpal tunnel syndrome	7	1	0	0
De Quervain's disease	6	1	1	0
Lateral epicondylitis *	3	3	1	0
Frozen shoulder	3	2	3	0
Rotator cuff tendonitis	5	2	1	0
Non-specific diffuse forearm pain	0	3	5	0
Cervical spondylosis	3	4	1	0
Non specific shoulder/neck pain *	0	2	5	0
Arthritis	1	3	4	0



* one consultation not recorded

Figure 1
GPs diagnosis before and after using the AID

at the expense of undecided diagnoses, which decreased from 37.5% to 21.3%, and incorrect diagnoses which decreased from 20% to 10%.

It should also be noted that the increase in correct diagnoses was greater for the modified AID than it was for the older version of the AID (40% to 66.3% compared to 40% to 53.3%). In addition, while use of the older version generally reduced the number of undecided diagnoses, use of the modified version went further by also reducing the number of wrong diagnoses, essentially by half.

A Wilcoxon Matched-Pairs t-test was used to compare the average diagnosis ratings before and after the AID was used. It was found that the mean diagnosis ratings were significantly higher after the AID had been used compared to before ($p = 0.0001$). This supports the hypothesis that on average, GPs made significantly more correct diagnoses after using the AID.

The second hypothesis was that there were significant differences between the mean diagnosis ratings for each of the ten syndromes. Figure 2 allows comparison of the mean diagnosis ratings for the five hand/wrist syndromes before and after the AID was used. It can be seen that GPs had particular difficulty

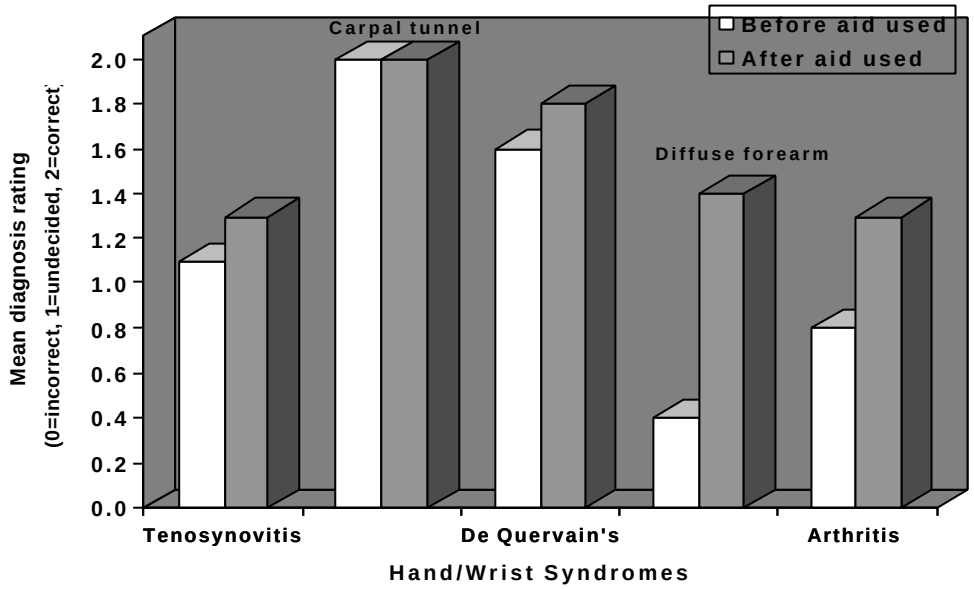


Figure 2
Mean diagnosis ratings for hand/wrist disorders before and after use of AID

diagnosing non-specific diffuse forearm pain. The use of the AID seems to have increased the number of correct diagnoses of this disorder, and of arthritis to a lesser extent.

Figure 3 allows comparison of the mean diagnosis ratings for the five elbow/upper arm syndromes before and after the AID was used. It can be seen that GPs had particular difficulty in diagnosing non-specific shoulder/neck pain but that use of the AID seems to have increased the number of correct diagnoses for this disorder. In addition, use of the AID appears to have considerably improved the diagnosis of frozen shoulder and cervical spondylosis.

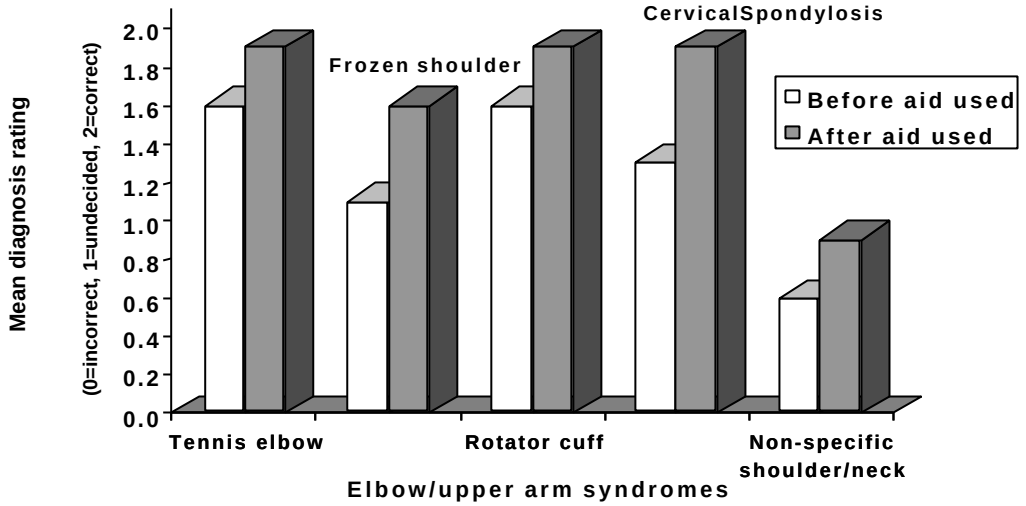


Figure 3
Mean diagnosis ratings for elbow/upper arm disorders before and after use of AID

Figure 4 shows the average increase in diagnosis rating for each syndrome, following use of the AID. The most striking increase has occurred for non-specific diffuse forearm pain as well as sizeable increases for arthritis, frozen shoulder and cervical spondylosis. This suggests that the AID provides a useful support for diagnosing these syndromes.

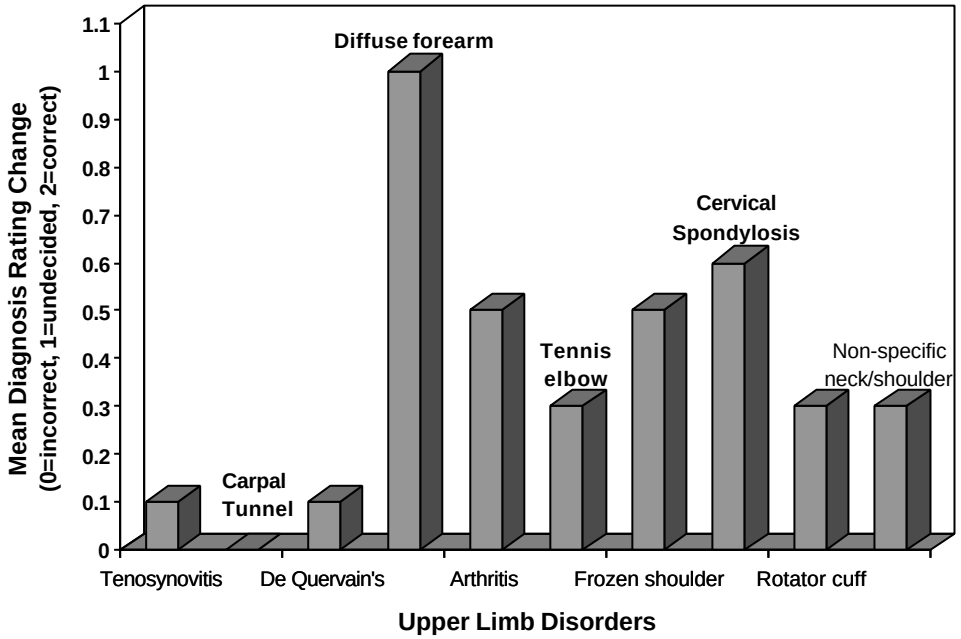


Figure 4
Average improvement in diagnosis for each syndrome following use of AID

A Friedman repeated-samples analysis-of-variance showed there were significant

differences in the mean ratings of diagnosis, between each of the ten syndromes presented to GPs ($p = 0.0047$). This suggests that some disorders had significantly higher diagnosis ratings than others. In other words, some disorders were diagnosed more accurately than others. The non specific disorders have lower diagnosis ratings than most other disorders. It seems that the AID significantly increased the accuracy of diagnosis for these disorders, in particular non-specific diffuse forearm pain.

3.3.2 Effectiveness of the AID - OPs

Table 3 gives an indication of how effectively the AID guided OPs to the correct diagnosis. It categorises OPs in terms of whether their initial and final diagnoses were either right, wrong, or undecided.

It can be observed that the disorders most commonly diagnosed wrongly were diffuse forearm pain, non-specific neck/shoulder pain and arthritis. Also that the AID seems to have helped OPs reach the correct diagnosis particularly for the two non-specific syndromes, rotator cuff tendonitis, and De Quervain's disease.

Table 3
OPs' diagnosis of each disorder in terms of initial and final diagnoses

DISORDER	Initial & final diagnosis correct	Initially uncertain /wrong to final diagnosis correct	Initial & final diagnosis uncertain/wrong	Initially correct to final diagnosis uncertain/wrong
Wrist flexor tenosynovitis	5	2	3	0
Carpal tunnel syndrome	9	1	0	0
De Quervain's disease	6	4	0	0
Lateral epicondylitis	10	0	0	0
Frozen shoulder	5	3	1	1
Rotator cuff tendonitis	3	6	1	0
Non-specific diffuse forearm pain	1	5	4	0
Cervical spondylosis	9	1	0	0
Non specific shoulder/neck pain	0	4	6	0
Arthritis	3	3	4	0

From Table 3 it seems that first, the AID has guided a number of OPs to the correct diagnosis from initially being uncertain or incorrect. Secondly, it appears the AID has been more helpful for diagnosing some syndromes than others. These hypotheses were tested for statistical significance in order to strengthen the initial findings.

The first hypothesis was that, on average, there were significantly more correct

diagnoses after using the AID. Figure 5 shows that the number of correct diagnoses increased from 51% to 78% with use of the AID. This was mainly at the expense of undecided diagnoses which decreased from 27% to 5%.

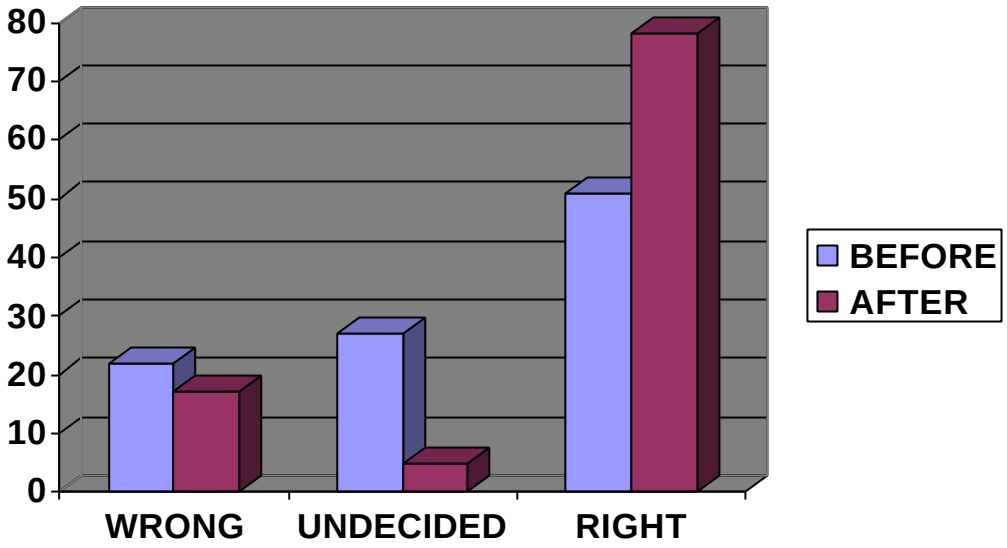


Figure 5
OPs diagnosis before and after using the AID

A Wilcoxon Matched-Pairs t-test was used to compare the average diagnosis ratings before and after the AID was used. It was found that the mean diagnosis ratings were significantly higher after the AID had been used compared to before ($p = 0.0003$). This supports the hypothesis that on average, OPs made more correct diagnoses after using the AID compared to before they used the AID.

The second hypothesis was that there were significant differences between the mean diagnosis ratings for each of the ten syndromes. Figure 6 shows the mean

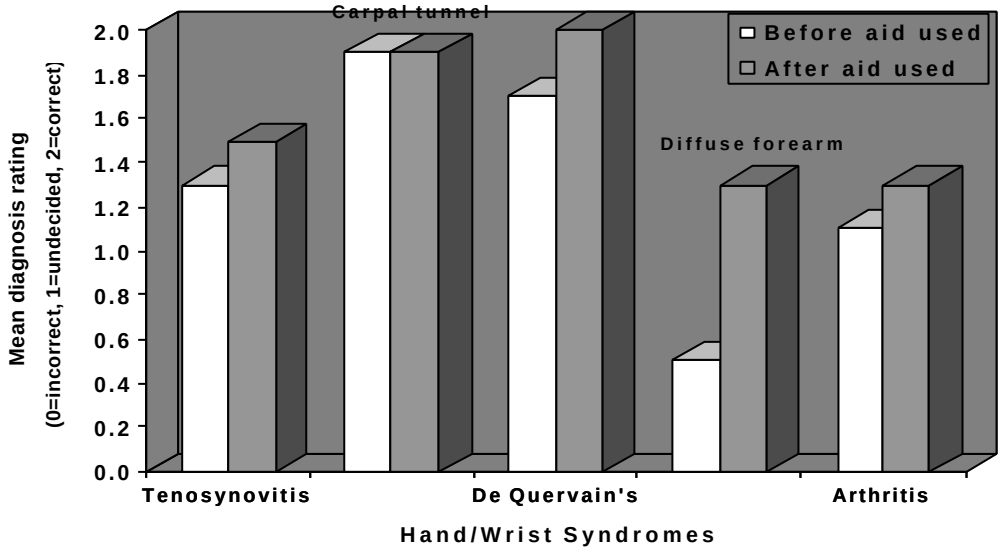


Figure 6
Mean diagnosis ratings for hand/wrist disorders before and after use of AID

diagnosis ratings for the five hand/wrist syndromes before and after using the AID. It can be seen that OPs had particular difficulty in diagnosing non-specific diffuse forearm pain, although the correct diagnosis of this disorder seems to have increased after the AID had been used.

Figure 7 shows the mean diagnosis ratings for the five elbow/upper arm syndromes before and after using the AID. It can be seen that OPs had particular difficulty in diagnosing non-specific shoulder/neck pain and rotator cuff tendonitis although the correct diagnosis of these disorders seems to have increased after the AID had been used.

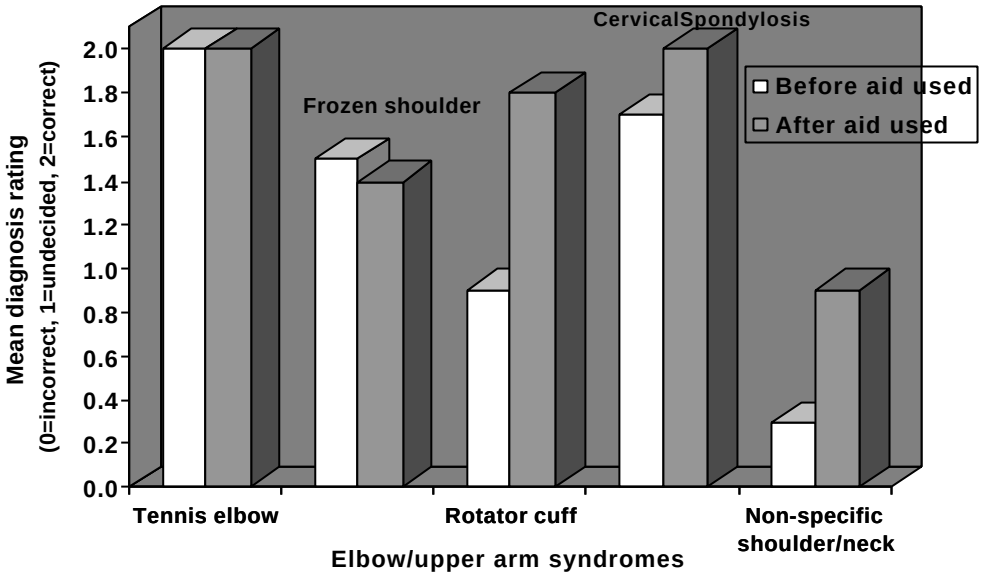


Figure 7
Mean diagnosis ratings for elbow/upper arm disorders before and after use of AID

Figure 8 shows the average increase in diagnosis rating for each syndrome,

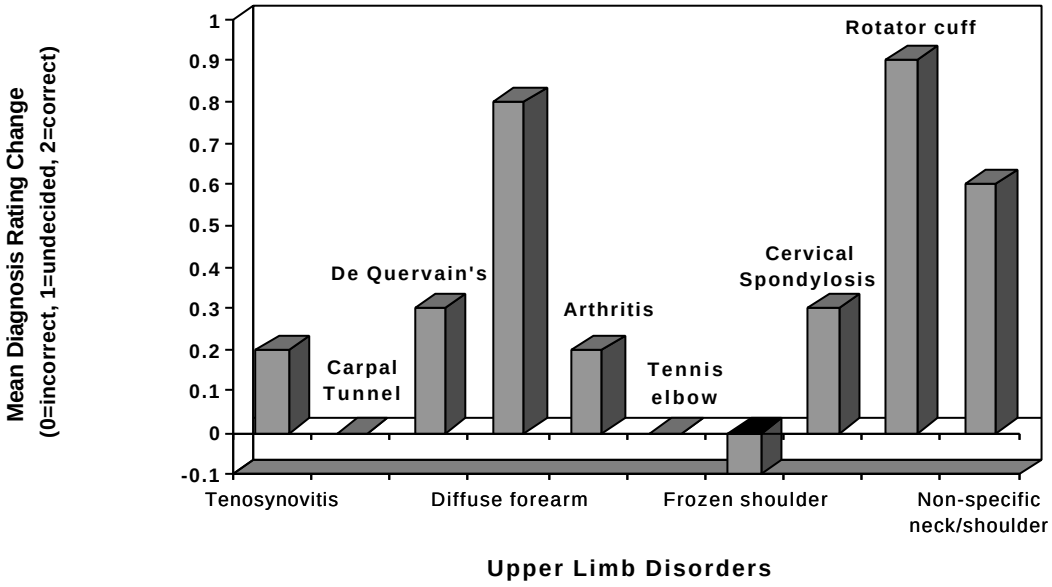


Figure 8
Average improvement in diagnosis for each syndrome after use of AID

following use of the AID. The most striking increases occurred for the two diffuse syndromes, as well as rotator cuff tendonitis. This suggests that the AID provides a useful support for diagnosing these syndromes. It did not, however, help with frozen shoulder.

A Friedman repeated-samples analysis-of-variance showed there to be significant differences in the mean ratings of diagnosis, between each of the ten syndromes presented to OPs ($p = 0.00005$). This suggests that some disorders had significantly higher diagnosis ratings than others. In other words, some disorders were diagnosed more accurately than others. The non specific disorders have lower diagnosis ratings than most other disorders. It seems that the AID significantly increased the accuracy of diagnosis for these disorders as well as rotator cuff tendonitis.

3.3.3 Usability of the AID - GPs

3.3.3.1 AIDs influence on GPs diagnostic decisions

From analysis of verbal protocols, it was possible to assess if the AID had influenced GPs diagnostic decisions in any way. It was found that some GPs were still unsure about some of the more ambiguous syndromes despite the changes which had been made to the AID as a result of the Occupational Physician trials. The disorders which seemed to cause most difficulty were arthritis, frozen shoulder and the non-specific syndromes, in particular diffuse forearm pain. As a result, the AID was further modified as follows:

a) A symptom box for the non-specific syndromes was provided
b) The “check for” arthritis box was changed to refer to the affected joint
c) All shoulder disorders were cross checked on the AID
d) It was emphasised that restriction is “global” for frozen shoulder

Verbal protocol analysis also suggested changes to the GP training package which were likely to increase GPs’ awareness of how to use the AID effectively. It was emphasised in the training package that when using the AID, consideration of more than one disorder is acceptable.

3.3.3.2 GP Views on AID

Questionnaires were returned by 7 of the 8 GPs who participated. The following areas of importance were identified:

a) Aide memoire didn’t make a difference for 3 out of 7 GPs (42%)
b) Aide memoire provided a relevant prompt for 2 out of 7 GPs (28%)
c) 2 out of 7 GPs thought the aide memoire contained too much information
d) 28% of GPs felt the AID was most useful for less obvious non-specific syndromes
e) 2 out of 7 GPs (28%) felt AID helped with uncertain diagnoses

f) 2 out of 7 GPs (28%) felt layout of the AID was good

g) 28% of GPs thought AID should be laminated

These comments were taken into consideration along with results of the Verbal Protocol Analysis to consider ideas for making the AID more usable.

3.3.4 Usability of the AID - OPs

3.3.4.1 AIDs influence on OPs diagnostic decisions

From analysis of verbal protocols, it was possible to assess if the AID had influenced OPs diagnostic decisions in any way. It was found that the process of elimination i.e. the order in which disorders were positioned in the flowchart, seemed to have adverse affects on the diagnostic decisions of some OPs. For example, because Cervical Spondylosis was the first disorder in part C of the AID, (see Appendix 5) some doctors tended to pursue this without considering the non-specific alternative.

In addition, OPs tended to confuse disorders which shared common symptoms, especially those of the shoulder. Often OPs would not thoroughly review the diagnostic possibilities, in particular, paying little attention to the non-specific option. Finally, some OPs did not use parts D and E of the AID and those who did skipped much of the information.

These findings led to the following changes being made to the AID:

a) The order in which the syndromes were listed in parts B and C of the AID was altered, bringing syndromes which were confused in the study closer together

b) Disorders which shared common symptoms were cross referenced on the AID

c) The information in parts D and E of the AID, on confirmatory symptoms and potential risk factors, was made more concise

Verbal protocol analysis also suggested changes to the OP training package which were likely to increase OPs' awareness of how to use the AID effectively. It was emphasised in the training package that diffuse pain was far more common than precise pain, to make OPs aware of the 'non specific pain' alternative on the AID. Also that the risk factors should always be noted, to increase the probability that OPs effectively assess a disorder's work relatedness, and that parts B and C should only be used after taking a full patient history, to increase the chances of the AID providing effective support.

3.3.4.2 OP Views on AID

Questionnaires were returned by 8 of the 10 OPs who participated. The following areas of importance were identified:

a) The Aide Memoire acted as a prompt for 25% of OPs (2 out of 8).

b) 50% of OPs felt the entire Aide Memoire was of little use (4 out of 8).

c) 2 out of 8 (25%) OPs felt the lower part of the aide memoire was surplus to requirements.

d) 2 out of 8 (25%) OPs thought some information could be put in an appendix e.g. how to carry out a particular physical examination test such as Phalen's test.

e) 50% of OPs felt parts B and C provided useful support in the diagnosis in terms of providing confidence by confirming their thoughts or serving as an Aide Memoire.

f) 25% of OPs found the risk factors to be useful for judging the causation of a disorder.

g) 2 OPs (25%) felt there should be an option to loop back onto the flowchart in part B or C if the diagnosis which they originally thought was 'best fit' turned out to be unsuccessful.

These comments were taken into consideration along with results of the Verbal Protocol Analysis to put together ideas for making the AID more usable.

3.4 DISCUSSION

3.4.1 GPs

The results provided initial indications that the AID was fulfilling its aims. Firstly, there was evidence that use of the AID helped GPs reach a more accurate diagnosis overall. The percentage of correct diagnoses increased after use of the AID at the expense of incorrect and undecided diagnoses. This was shown to be statistically significant.

It was also found that the version of the GP AID modified according to the OP trials provided more support than the older version of the GP AID. There were more correct diagnoses after use of the modified version of the AID compared to the older version and incorrect diagnoses were reduced by more. The results of this comparison were taken as an indication that changes to the older version of the AID had improved its effectiveness.

It also seems that the AID was more helpful for some disorders than others. Analysis of the results showed that for some disorders, most GPs initial diagnosis was correct, meaning the AID could not help GPs to improve upon this. This was the case for the more distinct disorders with better established clinical features such as Carpal Tunnel Syndrome and Tennis Elbow. For some of the disorders with more ambiguous symptoms, GPs were often uncertain or incorrect with their initial diagnosis. This was particularly true of the non-specific syndromes, arthritis and frozen shoulder. In these cases the AID helped GPs to a more accurate diagnosis.

There is also evidence that GPs felt they benefited from the AID in terms of being more confident about their final diagnosis. More than half of the GPs who returned a questionnaire felt that the AID had been a useful support in the diagnosis of uncertain or less obvious syndromes. This supports D'Auria (1995) who suggested GPs may benefit from some type of support AID which could help them reach a

more considered conclusion in the diagnosis of ULDs.

There were a number of negative comments from the questionnaires concerning Part A of the AID. Three of the GPs who returned a questionnaire thought that Part A made no difference to the consultation and a further two GPs thought it contained too much information. This implies that the majority of GPs who took part would alter Part A in some way. This issue was already raised by the occupational physician trials, resulting in Part A being made more concise and becoming an optional part of using the AID.

Verbal Protocol Analysis (VPA) provided invaluable information about fine detail of the AID which could be changed to make it more usable. These changes mainly involved adding to the AID to help differentiate between syndromes which were most confused in the trials i.e. non-specific disorders, arthritis and frozen shoulder. VPA also picked up on training issues which should be emphasised to give GPs the best chance of using the AID effectively.

3.4.2 OPs

The results provided initial indications that the AID was fulfilling its aims. Firstly, there is considerable evidence that use of the AID helped OPs reach a more accurate diagnosis. The percentage of correct diagnoses increased after use of the AID mostly at the expense of incorrect diagnoses and this was shown to be statistically significant.

It also seems that the AID was more helpful for some disorders than others. Analysis of the results shows that for some disorders most OPs initial diagnosis was correct, meaning the AID could not help OPs to improve upon this. This was the case for the more distinct disorders with better established clinical features such as Carpal Tunnel Syndrome and Tennis Elbow. For some of the disorders with more ambiguous symptoms, OPs were often uncertain or incorrect with their initial diagnosis. This was particularly true of the non-specific syndromes and Rotator Cuff Tendonitis. In these cases the AID led OPs to a more accurate diagnosis.

There was also evidence that OPs felt they benefited from an AID in providing a standardised approach to the diagnosis of ULDs. Half of the OPs who returned a questionnaire felt that the AID had been a useful support in the diagnosis in terms of providing confidence by confirming their thoughts or serving as an Aide Memoire. One quarter of them thought the risk factors were useful for judging the causation of a disorder. This supports Cooper and Baker (1996) who made the case for a standardised method of labelling, clinically evaluating, and treating ULDs to assist OPs.

There were a number of negative comments from the questionnaires concerning Part A of the AID. Half of the OPs who returned a questionnaire expressed the opinion that Part A was of little use with another two stating that this was true of the bottom section. This implied that the majority of OPs wanted the content of Part A to be changed to provide more value. As a result, Part A was made more concise and became an optional part of using the AID.

In a similar way to the GP study, VPA provided invaluable information about fine detail of the AID which could be changed to make it more usable. These changes included re-ordering disorders in the flowchart and providing appropriate points when OPs should cross reference a disorder. VPA also picked up on training issues which should be emphasised to give OPs the best chance of using the AID effectively.

3.4.3 Use of Verbal Protocol Analysis (VPA)

The studies showed Verbal Protocol Analysis (VPA) to be an effective method for assessing the usability of this product. This is consistent with what others have found when using VPA for this purpose (see Rooden, 1998). The technique provided detailed information about how the diagnostic AID influenced both OPs and GPs decision making during the consultations. It proved to be sensitive to characteristics of the AID which shaped an both an OPs and GPs final diagnosis and as such provided invaluable information about fine detail of the AID which could be changed to make it more usable.

One of the main disadvantages of VPA was that some OPs and GPs did not feel comfortable talking about their thoughts while diagnosing or were not clear about the type of thoughts they should verbalise. As a result, these specific protocols contained very little useful information about the AID. One solution to this might be to let subjects practise talking about their thoughts. Unfortunately, the strict timescales of the current study meant this was not possible.

3.5 CONCLUSIONS

3.5.1 GP Study

3.5.1.1 The study confirmed that the AID was significantly effective in increasing the number of correct diagnoses made by the GPs.

3.5.1.2 It was shown that use of the AID significantly improved the average diagnosis rating for the two diffuse syndromes, as well as arthritis and frozen shoulder suggesting that the AID provides a useful support for diagnosing these syndromes in particular.

3.5.1.3 The majority of GPs felt the AID had helped them diagnose the more uncertain or less obvious syndromes.

3.5.1.4 The results from verbal protocol analysis and the questionnaire raised a number of issues in relation to how the design of the AID could be changed to improve it's usability. This mostly involved adding to the AID to help differentiate between syndromes which were often confused in the trials.

3.5.1.5 Results from verbal protocol analysis also suggested changes to the GP training package which were likely to increase GPs' awareness of how to use the AID effectively.

3.5.2 OP Study

3.5.2.1 The study confirmed that the AID was significantly effective in increasing the number of correct diagnoses made by the OPs.

3.5.2.2 It was shown that use of the AID significantly improved the average diagnosis rating for the two diffuse syndromes, as well as rotator cuff tendonitis suggesting that the AID provides a useful support for diagnosing these syndromes in particular.

3.5.2.3 The majority of OPs felt they had benefited in some way from using a standardised approach to the diagnosis of ULDs.

3.5.2.4 The results from verbal protocol analysis and the questionnaire raised a number of issues in relation to how the design of the AID could be changed to improve it's usability. These included; making Part A an optional part of using the AID and altering the order in which the syndromes were listed in parts B and C.

3.5.2.5 Results from verbal protocol analysis also suggested changes to the OP training package which were likely to increase OPs' awareness of how to use the Aid effectively. These included emphasising that diffuse pain is far more common than precise pain and that parts B and C should only be used after taking a full patient history.

4. FIELD STUDY TO ASSESS GP AND OP PERCEPTIONS OF THE EFFECTIVENESS AND USABILITY OF THE AID

4.1 BACKGROUND

The results from the experimental studies of the AID based on ten OPs and eleven GPs generated recommendations for changes to improve its effectiveness and that of its accompanying training package, including:

a) changes to the sequence of diagnostic decisions
b) prompts to examine alternative diagnoses for ambiguous shoulder symptoms or nerve symptoms
c) refinement of the information provided for differentiating syndromes
d) emphasis in the training package on the AID's benefits to doctors

On the whole, the original format and contents of the AID were maintained, and the types of syndromes (i.e. upper limb disorders of the hand/wrist, elbow, shoulder and neck) covered remained the same.

It can be concluded that the first series of experimental studies provided early indications that the AID was fulfilling its aims. Both the OPs and GPs reached a more accurate diagnosis using the AID. This was demonstrated by statistically significant increases in the percentage of correct diagnoses at the expense of incorrect and undecided diagnoses.

In addition, it was shown that both samples of doctors had greater difficulty diagnosing certain types of disorders, particularly non-specific syndromes and rheumatoid arthritis, implying there was greater need to provide diagnostic support with these types of conditions. The findings were used to help in prioritising changes to the AID, in order to target support for diagnosis where it was most needed.

The study reported below involved assessing the utility of the modified version of the AID by asking OPs and GPs to apply it during normal consultations. This study was aimed at answering the following research questions:

a) What are the doctors' perceptions of the effectiveness and usability of the AID?

b) What modifications and additional support documents, if any, will be required to accommodate doctors' perceptions of the AID's effectiveness and usability?

The following list of questions are a direct representation of the original field study research questions, refined specifically to use the collated data.

a) How strong is the study group's agreement with each statement on issues of effectiveness and usability of the AID?

b) Is the level of agreement with each statement related to clinical experience?

c) Does the level of agreement with each statement vary for different groups of disorder?
d) What modifications and additional support documents, if any, will be required to accommodate doctors' perceptions of the AID's effectiveness and usability?

4.2 APPROACH

4.2.1 Overview

An evaluation form was developed in order to record doctors' perceptions of how the AID supported the diagnosis of particular disorders (Appendix 3.A). This evaluation form was identical for both GPs and OPs except that questions 13, 14 and 15 were provided for the OPs to cover the supplementary information. The evaluation forms required subjects to record their initial working diagnosis before using the AID and the final diagnosis recommended by it. The forms also contained statements with which subjects indicated their agreement, using a five point scale ranging from "strongly agree" to "strongly disagree". The statements covered issues dealing specifically with the AID perceived usability and effectiveness during individual consultations.

A questionnaire (Appendix 3.B), identical for both GPs and OPs, was also developed to deal with broader issues of the AID overall usability, concentrating on its design and presentation. These issues were dealt with using statements with which subjects indicated their agreement, and space was provided for subjects to suggest improvements. The questionnaire was also used to collect data on each doctor's years of experience as well as day to day experience of upper limb complaints.

A number of geographical regions throughout the United Kingdom were involved in obtaining samples of GPs and OPs. The objectives of this approach were to give a representative coverage of backgrounds, maximise the numbers of subjects available and increase the visibility of the study and its products. Due to the relatively larger number of GPs within the UK, major population centres were targeted, e.g. Scottish Central Belt, Birmingham, and Cardiff. The strategy involved placing an advertisement in a national GP weekly publication, and drawing up a list of GPs to be contacted, using replies to the advertisement and lists of practising GPs.

The overall sampling strategy for participants was developed with the aim of demonstrating a suitably broad coverage of different disorders and an appropriately high number of each of the more common conditions (in particular those given labels by the AID). OPs and GPs were invited to participate with the proviso that they are likely to see at least a set number of patients (suggested 10 patients) with upper limb complaints during the study period.

Local Medical Committees (LMCs) were approached to obtain lists of GPs in each area. Invitations were sent to two hundred OPs, of which 68 agreed to participate, a response rate of 34%. Four hundred and forty eight invitations were sent to GPs with 37 willing to participate, an initial response rate of 8.3%. Additional GP recruitment was undertaken by targeting practices in London, Manchester and

Liverpool, with around 400-500 invitations, providing the final total.

Sixty eight Occupational Physicians (OPs) and 123 General Practitioners (GPs) were sent copies of the AID to use in their practices for an eight week period.[1] They were provided with evaluation forms (Appendix 3.A) to be completed each time the AID was used and a questionnaire (Appendix 3.B) to be filled in at the end of the field trial period. 33 OPs and 33 GPs completed and returned their forms and questionnaires.

The initial data analysis consisted of descriptive statistics and inferential statistics. Descriptive statistics from the evaluation study data were used give an indication of how the AIDs influenced the consultations. Equivalent data from the post-trial questionnaire were important from the point of view of refining the content of the AIDs. In addition, these figures could be quoted when selling the final product to its users.

The inferential statistical analysis was undertaken to give an indication of how much support the AID had provided for different groups of doctors and for different groups of symptoms. This was to provide information on which group benefited most from the AID, which could affect how the final version is presented. It was to help to determine if there was a significant need for the AID to contain more support for certain groups of symptoms which might affect the content of the AID.

4.2.2 Perceptions of AID's Effectiveness and Usability

Appendix 3.A shows the evaluation form which the subjects used to indicate their views using a five-point rating scale on various aspects of the AID's effectiveness. The data collected included perceptions on whether the AID led to a more accurate diagnosis, more informed diagnosis, whether it was useful for judging work-relatedness of a condition, or affected the clinician's management plan. Usability issues were also covered, in relation to ease of use of the AID, and acceptability of time required to use the AID. Each evaluation form also collected data on the initial working diagnosis of the clinician before using the AID, as well as the final diagnosis recommended by the AID, so that findings of the study could be grouped according to the type of condition.

The level of agreement with each statement was examined using descriptive statistics to examine the frequency of each of the five possible responses to each statement. This analysis approach was designed to produce a comprehensive evaluation of the AID's usability and effectiveness in a real practice environment.

4.2.3 Doctors Experience and Background

More experienced doctors could be less likely to accept that a diagnostic AID led them to an improved diagnosis. Consequently, data on the background of doctors was collected to investigate this aspect. This included experience in general

[1] Sixty six of the GPs were asked to use the Aid for six weeks, due to project time constraints.

practice, occupational medicine, orthopaedics and rheumatology, as well as frequency of dealing with upper limb complaints.

The relationship between agreement with each statement and level of experience was first explored using descriptive statistics. The tables showed the frequency of agreement or non-agreement with a given statement grouped by the level of experience of the doctor. These data were used to explore the relationship of agreement against three measures of clinical experience:

a) frequency of presentation of upper limb complaints in practice

b) years in general practice

c) total years' occupational medicine experience

The relationships were then checked for their significance using inferential statistics. The hypothesis that there was an association needed to be tested further. A simple correlation test was not suitable, since the measure of agreement used non-scalar (ranked or nominal) data. A cross-tabulation (contingency table) procedure was undertaken using SPSS for Windows (Kinnear & Gray, 1997). A Pearson Chi-square statistic was generated to establish the significance of any statistical association.

This part of the analysis was used to examine how the level of experience of doctors influenced their perceptions of the AID, which could have important implications for the way the final version of the AID would be presented.

4.2.4 Agreement Groups of Disorder

The amount of agreement for each statement in relation to different groups of disorder was explored by descriptive statistics. Five distinct groups of disorders covered by the AID were defined, along with a group of those disorders not covered: These were;

a) Hand/wrist specific
b) Elbow specific
c) Shoulder specific
d) Neck specific
e) Non-specific
f) Not included in AID

A bar chart was produced for each statement, providing the proportion of doctor's agreements with each statement grouped by the final diagnosis. The above categories were used, but with category (f), it was usually necessary to refer to the initial recorded diagnosis.

The fact that a number of cases were not covered by the AID could go some way to explain negative responses which were not necessarily due to design faults in the AID. For the cases not covered by the AID it is important to examine whether these should be added to the AID, or whether the training package should be modified to define more precisely the types of disorders covered.

4.3 FUTURE DESIGN OF AID

Participants' views on future aspects of the AID's design were obtained by analysing the Post-Trials questionnaire (see Appendix 3.B). Participants indicated their level of agreement on number of statements about the AID, by checking a box for each statement and elaborating further in writing, as appropriate. A five point scale ranging from Strongly Agree to Strongly Disagree was used to allow ranked data. These were intended to help prioritise the information taken from written answers to decide on the final design of the AID.

The views on the design of the AID were examined initially by descriptive statistics. This involved looking at the frequencies of responses in each statement in the questionnaire. The overall frequency of agreement for each statement was then used to rate the importance of the doctors' written design recommendations. These recommendations, along with the priority ratings, were then collated and presented to the Project Steering Group for a final decision on their implementation.

4.4 FINDINGS

4.4.1 Response Characteristics

4.4.1.1 GPs

In total, 285 evaluation forms were completed by 33 GPs. The coverage of different disorder groups is shown in Table 4. From this it can be seen that in 20% of cases GPs came to a specific diagnosis using Part B (see Appendix 5, hand/wrist/forearm disorders) of the AID. In 55% of cases, Part C was needed to reach a specific diagnosis. There were 12% non-specific conditions covered, while 12% of the disorders were not covered by the AID. In addition, the largest proportion were shoulder specific, and shoulder/ neck combined.

Table 4
Number of disorders diagnosed by GPs in relation to each type

Disorder group	Number diagnosed using AID	Percent diagnosed using AID
Hand/wrist specific	58	20
Elbow specific	33	12
Shoulder specific	101	35
Neck specific	24	8
Non-specific	34	12
Not included in AID	35	12
Totals	285	

4.4.1.2 OPs

In total, 264 evaluation forms were completed by 33 Occupational Physicians. The coverage of different disorder groups is shown in Table 5. From this it can be seen that in 32% of cases OPs came to a specific diagnosis using Part B

(hand/wrist/forearm disorders) of the AID. Similarly, in 35% of cases, Part C was needed to reach a specific diagnosis. The number of non-specific conditions covered amounted to 19%. Finally, 13% of the disorders were not covered by the AID.

Table 5
Number of disorders diagnosed by OPs in relation to each type

Disorder group	Number diagnosed using AID	Percent diagnosed using AID
Hand/wrist specific	85	32
Elbow specific	38	14
Shoulder specific	41	16
Neck specific	16	6
Non-specific	50	19
Not included in AID	34	13
Totals	264	

4.4.2 Increase in Diagnostic Accuracy

4.4.2.1 GPs

Figure 9 shows the proportion of responses indicating that the AID helped the GP reach a more accurate diagnosis. Out of 285 consultations, doctors agreed that diagnostic accuracy was increased on 121 (42%) occasions and disagreed in 128 (45%) cases.

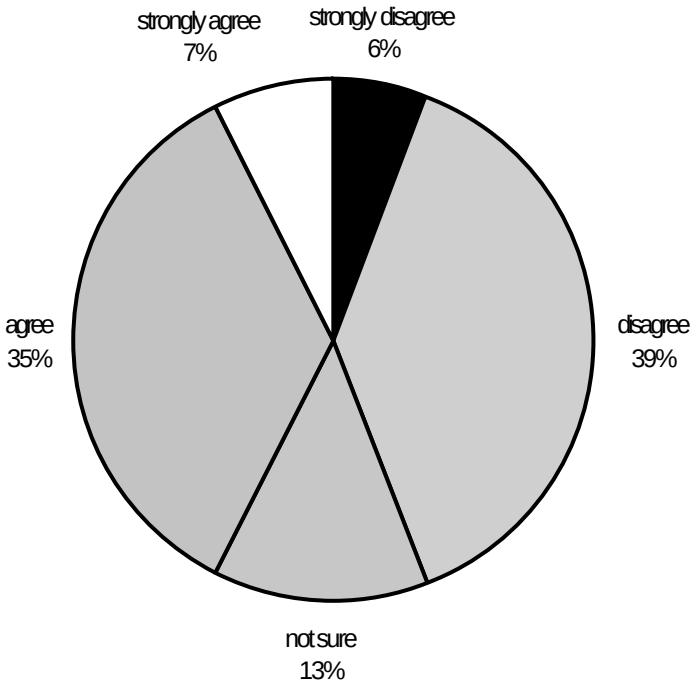


Figure 9
Proportion of responses indicating use of AID helped GPs reach a more accurate diagnosis

How these responses varied in relation to the experience of the doctors using the AID is shown in Tables 6 to 8. These show GP's agreement in relation to the frequency with which the GP is presented with upper limb complaints, the GP's total number of years' general practice and occupational medical experience.

Table 6
Cases seen and accuracy of diagnosis

	agree	not agree
less than 3 cases per week	96	103
at least 3 cases per week	23	52

Table 7
Accuracy of diagnosis and total years' general practice experience

	agree	not agree
less than 18 years	60	81
at least 18 years	59	74

Table 8
Accuracy of diagnosis and years' Occ. medicine experience

	agree	not agree
less than 1 year	66	113
at least 1 year	53	42

The analysis of the data in Table 6 indicates a highly significant association between GPs who see fewer upper limb complaints and agreement that the AID helped them to reach a more accurate diagnosis. This association was found to be significant beyond the 1% level (Pearson correlation, p=0.00887).

Table 7 appears to show no influence of general practice experience upon the level of agreement of increased diagnostic accuracy. This can be seen in the relatively even distribution of cases in each of the cells of the table.

The analysis of the data in Table 8 indicates a highly significant association between GPs with more years' occupational medicine experience and agreement that the AID helped them to reach a more accurate diagnosis. This association was found to be significant beyond the 1% level (Pearson correlation, p=0.00264).

How the type of disorder influenced the GPs' perceptions of whether the AID helped them reach a more accurate diagnosis is illustrated in Figure 10.

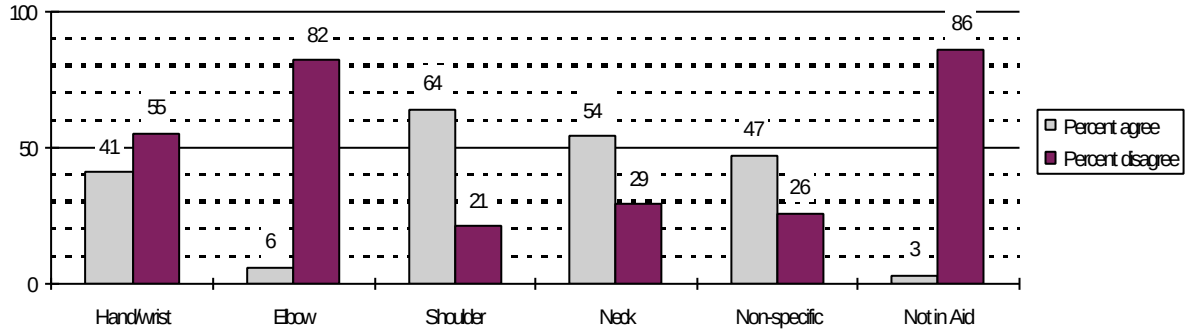


Figure 10
Disorder type and perception of AID helping GPs accuracy of diagnosis

From this, it is clear that the majority of GPs were more likely to agree that the AID helped increase accuracy for non-specific disorders, shoulder and neck disorders.

The AID was also believed to have increased diagnostic accuracy for a proportion (41%) of hand/wrist conditions.

However, it appears that the AID was not as useful for elbow conditions. This may be explained by the relatively straightforward diagnosis of elbow conditions, which the diagnostic AID may not be expected to improve. This is reinforced by the fact that 64% of GPs agreed that the AID could not be expected to refine their initial working diagnosis for elbow disorders. The agreement with this view was lower for all other disorders.

Finally, it was not surprising that 86% of the GPs did not find the AID helpful for those conditions not covered by the AID. This is likely to have contributed to the overall percentage of disagreements shown in Figure 9. It could have influenced the apparently similar split over the diagnostic accuracy.

It can be concluded that those GPs who see fewer cases were helped, while those with longer occupational medicine experience were also helped. Further, the majority of improvements in accuracy were in diagnosis of shoulder, neck and non-specific conditions.

4.4.2.2 OPs

Figure 11 shows the proportion of responses to the view that the AID helped the OP reach a more accurate diagnosis. Out of 264 consultations, OPs agreed that diagnostic accuracy was increased on 144 (55%) occasions and disagreed in 80 (30%) cases.

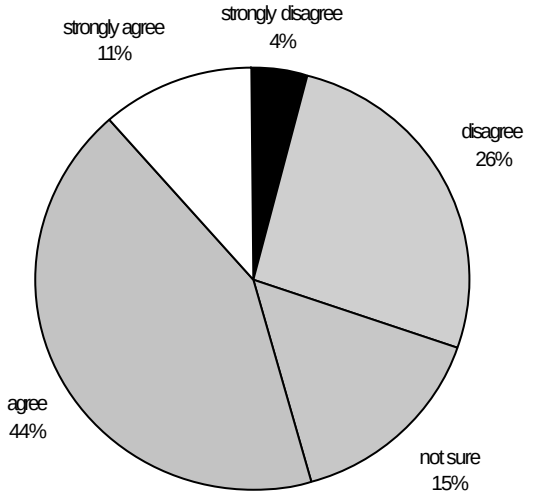


Figure 11
Proportion of responses indicating use of AID helped OPs reach a more accurate diagnosis

How these responses vary in relation to the experience of the Ops using the AID is shown in Tables 9 to 11. These show OPs agreement in relation to the frequency

with which the OP is presented with upper limb complaints at work, the total number of years' clinical experience (including occupational medicine, general practice, orthopaedics and rheumatology), and the total number of years' occupational medicine experience.

Table 9
Cases seen and accuracy of diagnosis

	agree	not agree
less than one case per week	28	11
at least one case per week	116	109

Table 10
Accuracy of diagnosis and total years' clinical experience

	agree	not agree
less than 20 years	73	59
at least 20 years	71	61

Table 11
Accuracy of diagnosis and years' Occ. medicine experience

	agree	not agree
less than 12 years	72	63
at least 12 years	72	57

The analysis of the data in Table 9 indicates a highly significant association between OPs who see fewer upper limb complaints and agreement that the AID helped them to reach a more accurate diagnosis. This association was found to be significant beyond the 5% level (Pearson correlation, p=0.0191). However, the practical significance of this apparent trend could be reduced by the relatively small number of consultations made by OPs in the less experienced group (i.e. only 39 of the total 264 cases).

Analysis of the data in Tables 11 and 12 appeared to show no influence of experience (either overall clinical or occupational medicine) upon the level of agreement that the AID increased diagnostic accuracy.

Figure 12 show how the type of disorder influenced the OPs' perceptions of whether the AID helped them reach a more accurate diagnosis.

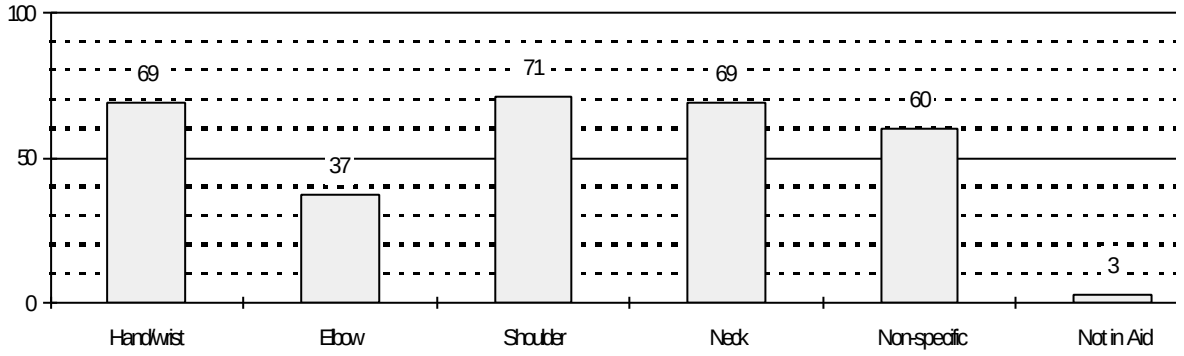


Figure 12
Disorder type and perception of AID helping OPs accuracy of diagnosis

From this, it is clear that OPs were more likely to agree that the AID helped increase accuracy for non-specific disorders, and hand/wrist, shoulder and neck disorders.

This tendency is lowest for elbow conditions, which may be due to their relatively straightforward diagnosis. This is reinforced by the fact that, for 38% of elbow disorders, OPs agreed that the AID could not be expected to refine their initial working diagnosis. This was lower than for all other categories of disorder.

Finally, it was not surprising that only 3% of the OPs found the AID helpful in improving their diagnostic accuracy for those conditions not covered by the AID. Those who were not helped are likely to have contributed to the overall percentage of disagreements shown in Figure 11. Without this effect it is possible that more OPs could have found the AID helpful in improving their diagnostic accuracy.

4.4.3 More Informed Decision-Making

4.4.3.1 GPs

Figure 13 shows the proportion of responses to the view that the AID helped the GPs make a more informed decision about the diagnosis. Out of 285 consultations, GPs agreed that decision-making became more informed on 148 (52%) occasions and disagreed in 105 (37%) cases. How these responses varied in relation to the experience of the doctors is explored in Tables 12 to 14.

Table 12 shows the number of complaints seen and informed decision making. There did not appear to be a significant association (Pearson correlation, non significant p=0.0694). Although there was an apparent difference, there did not seem to be a difference between the number of upper limb complaints seen and GPs agreement that the AID helped them to make a more informed decision.

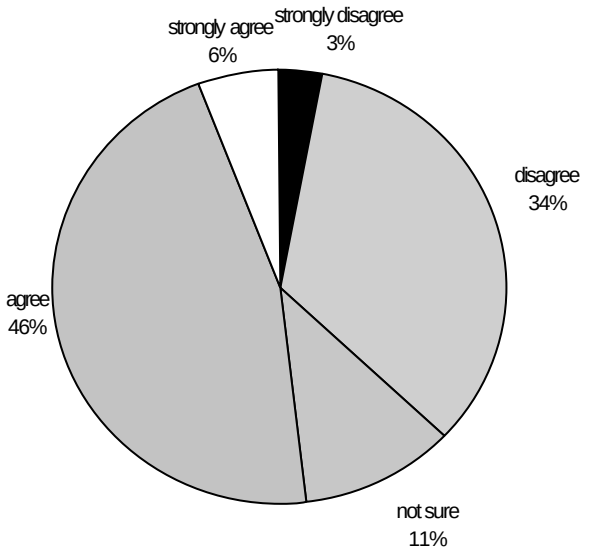


Figure 13
Proportion of responses in relation to GPs making a more informed decision about diagnosis

Analysis of the data in Table 13 indicated that GPs with less total years' general practice experience are more likely to agree that the AID helped them to make a

more informed decision about the diagnosis. This is significant beyond the 5% level (Pearson correlation, p=0.0119). GPs with more years' occupational medicine experience (see Table 14) might be more likely to agree that the AID helped them to make a more informed decision. This was significant beyond the 5% level (Pearson correlation, p=0.0134).

Table 12
Cases seen and AID informing decision

	agree	not agree
less than 3 cases per week	112	87
at least 3 cases per week	33	42

Table 13
AID informing decision and years' general practice experience

	agree	not agree
less than 18 years	85	56
at least 18 years	60	73

Table 14
AID informing decision and years' Occ. medicine experience

	agree	not agree
less than 1 year	85	94
at least 1 year	60	35

The relationship between the GPs view that the AID helped make a more informed decision and the type of disorder is illustrated in Figure 14. From this, it is clear that GPs were more likely to agree that the AID helped more informed decision-making for non-specific disorders and shoulder and neck disorders (over 60% of cases for each). This tendency was somewhat less for hand/wrist conditions although GPs were marginally more likely to agree that the AID helped more informed decision-making.

The proportion of elbow disorders for which the AID helped more informed decision-making was substantially less (18%), probably indicating that GPs did not feel they required much support in this diagnosis. This is reinforced by the fact that GPs agreed that the AID could not be expected to refine their initial working diagnosis for 68% of elbow disorders. Finally, it was not surprising that only 11% of the GPs found the AID helpful to improve informed decision for those conditions not covered by the AID. The 74% who were not helped are likely to have contributed to the overall percentage of disagreements shown in Figure 13. Without this effect it is possible that more GPs could have found the AID helpful in providing a more informed decision.

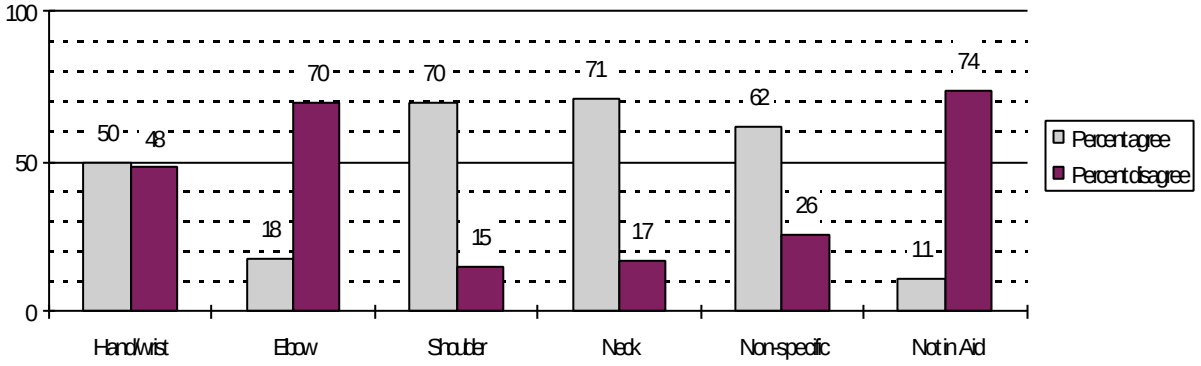


Figure 14
Disorder type and perception of AID helping GPs make a more informed decision about the diagnosis

4.4.3.2 OPs

Figure 15 shows the proportion of responses where the AID helped the OP make a more informed decision about the diagnosis. Out of 264 consultations, OPs agreed

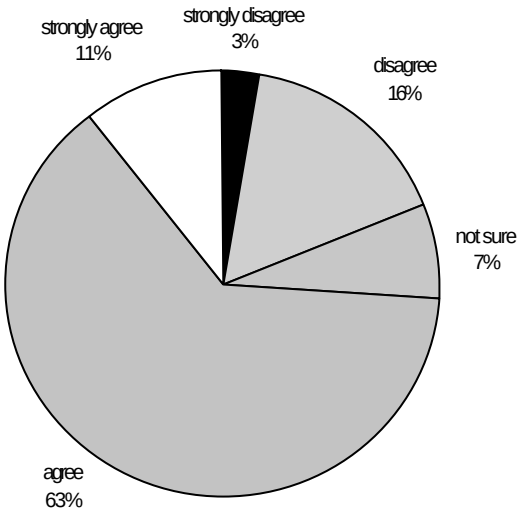


Figure 15
Proportion of responses in relation to OPs making a more informed decision about diagnosis

that decision-making became more informed on 195 (74%) occasions and disagreed in 50 (19%) cases.

How these responses vary in relation to the experience of the doctors using the AID is shown in Tables 15 to 17. Analysis of Table 15 indicates there did not appear to be a relationship between the number of complaints seen and the AID making a more informed decision (Pearson correlation non-significant, p = 0.207).

Further analysis of Tables 16 and 17 appeared to show no influence of

Table 15
Cases seen and AID informing decision

	agree	not agree
less than one case per week	32	7
at least one case per week	163	62

Table 16
AID informing decision and years' clinical practice experience

	agree	not agree
less than 20 years	97	35
at least 20 years	98	34

Table 17
AID informing decision and years' Occ. medicine experience

	agree	not agree
less than 12 years	102	33
at least 12 years	93	36

experience (either overall clinical or occupational medicine) upon the level of agreement that the AID led to more informed decision-making. This can be seen in either table by the proportion of agreements to disagreements being similar for each group.

The relationship between the OPs view that the AID helped make a more informed decision and the type of disorder is illustrated in Figure 16. From this, it is clear that OPs were more likely to agree that the AID helped more informed decision-making for non-specific disorders and hand/wrist, shoulder and neck disorders (over 80% of cases for each). This tendency was less for elbow conditions, although more than half were still more likely to agree that the AID helped a more informed decision.

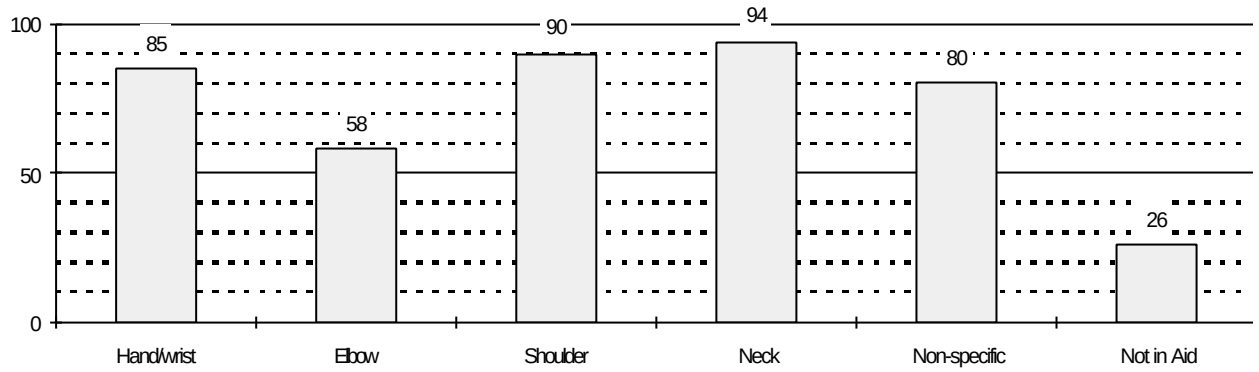


Figure 16
Disorder type and perception of AID helping OPs make a more informed decision about the diagnosis

4.5 USABILITY OF AID AND TIME TAKEN

4.5.1 GPs

Figure 17 shows the proportion of responses to the view that the time taken to use

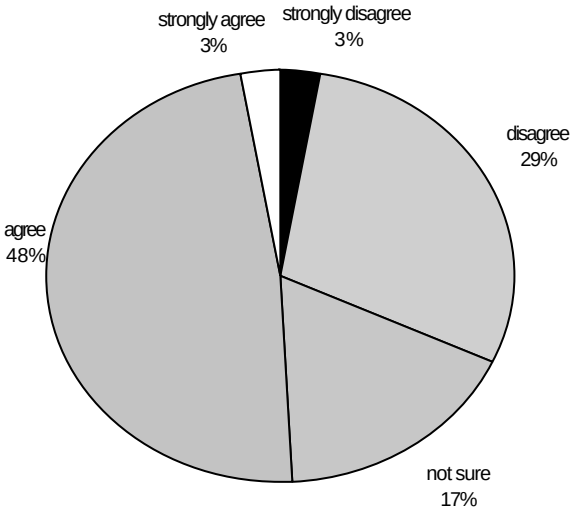


Figure 17
Percentage of GPs agreeing that time taken to use the AID in consultation was acceptable

the AID was acceptable. GPs agreed that time taken was acceptable on 144 (51%) occasions and disagreed in 91 (32%) cases.

How these responses vary in relation to the experience of the GPs using the AID is explored in Tables 18 to 20.

Table 18
Cases seen and time taken acceptable

	agree	not agree
less than 3 cases per week	118	81
at least 3 cases per week	24	51

Table 19
Time taken acceptable and years' clinical practice experience

	agree	not agree
less than 18 years	71	70
at least 18 years	71	62

Table 20
Time taken acceptable and years' Occ. medicine experience

	agree	not agree
less than 1 year	82	97
at least 1 year	60	35

The analysis of the data in Table 18 provided a highly significant indication that GPs who saw fewer upper limb complaints at work were more likely to agree that the time taken to use the AID was acceptable (beyond the 1% level, Pearson correlation, p=0.00006).

Analysis of the data in Table 19 showed no influence of experience upon the level of agreement that the time taken to use the AID was acceptable. This can be seen in the relatively even distribution of cases in each of the cross-tabulation cells for the table. Table 20, however, provided a highly significant indication that GPs with more years' occupational medicine experience were more likely to agree that the time taken to use the AID was acceptable (beyond the 1% level, Pearson correlation, p=0.00624).

Figure 18 shows the percentage of GPs agreeing that time taken in consultation to use the AID was acceptable, by disorder type. From this, it is clear that GPs were more likely to agree that time taken was acceptable for non-specific disorders, shoulder and neck disorders. It was also believed that time taken was acceptable for a substantial proportion (48%) of hand/wrist conditions. However, it appears that the time taken was not as acceptable for elbow conditions.

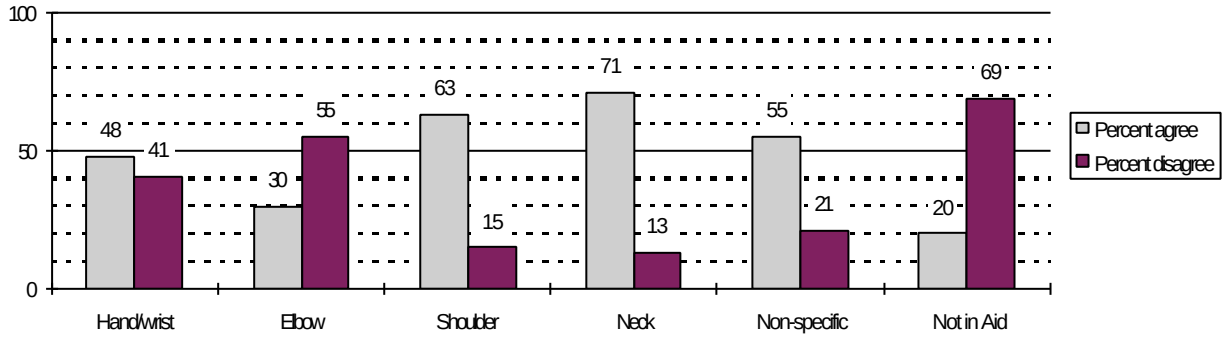


Figure 18
Percentage of GPs agreeing that time taken in consultation to use the AID was acceptable, by disorder type

4.5.2 OPs

Figure 19 shows the proportion of responses to the view that the time taken to use the AID was acceptable. OPs agreed that time taken was acceptable on 218 (82%) occasions and disagreed in 26 (10%) cases.

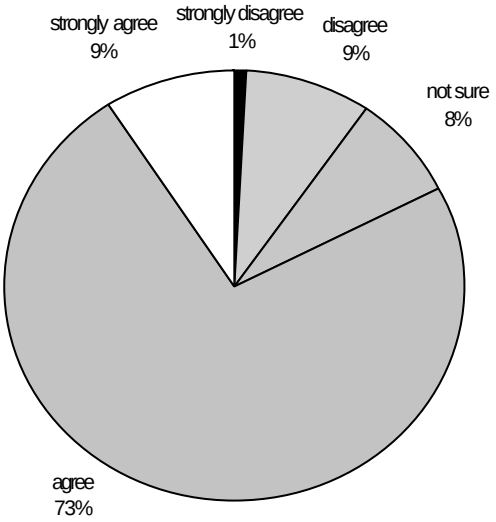


Figure 19
Percentage of OPs agreeing that time taken in consultation to use the AID was acceptable

How these responses vary in relation to the experience of the doctors using the AID is explored in Tables 21 to 23.

Table 21
Cases seen and time taken acceptable

	agree	not agree
less than one case per week	31	8
at least one case per week	187	38

Table 22
Time taken acceptable and years' clinical practice experience

	agree	not agree
less than 20 years	103	29
at least 20 years	115	17

Table 23
Time taken acceptable and years' Occ. medicine experience

	agree	not agree
less than 12 years	108	27
at least 12 years	110	19

Analysis of Table 21 does not show a significant relationship between OPs who see more upper limb complaints and the time taken to use the AID was acceptable. Similar non significant results are found for OPs with more total years' clinical experience with more years' occupational medicine.

Figure 20 shows the percentage of OPs' and acceptability of the time taken to use the AID in relation to type of disorder. It appears that OPs were likely to agree that the time taken to use the AID was acceptable for all disorders covered by the AID

(over 76% of cases for each). This finding was especially acceptable for shoulder and neck conditions.

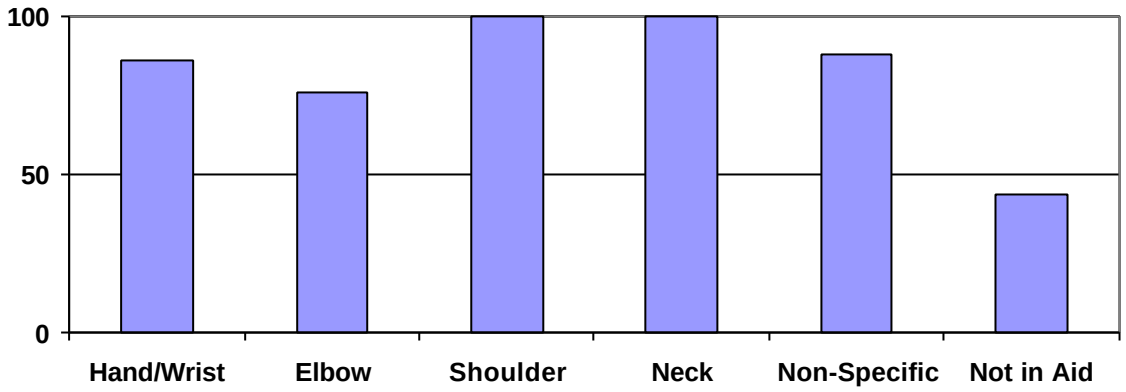


Figure 20
Percentage of OPs agreeing that time taken in consultation to use the AID was acceptable, by disorder type

As could reasonably be expected, the acceptability of the time taken is somewhat lower for conditions not covered by the AID. Even so, doctors were more likely to agree (44%) than disagree (41%, not shown in figure) that time taken was acceptable for these disorders.

4.6 USABILITY OF AID AND EASE OF USE

4.6.1 GPs

Figure 21 shows the proportion of responses to the assertion that the AID was difficult to use for diagnosing an individual disorder. Disagree or Strongly Disagree implies that they felt it was not difficult to use. Out of 285 consultations, GPs felt that the AID was not difficult to use on 214 (75%) occasions.

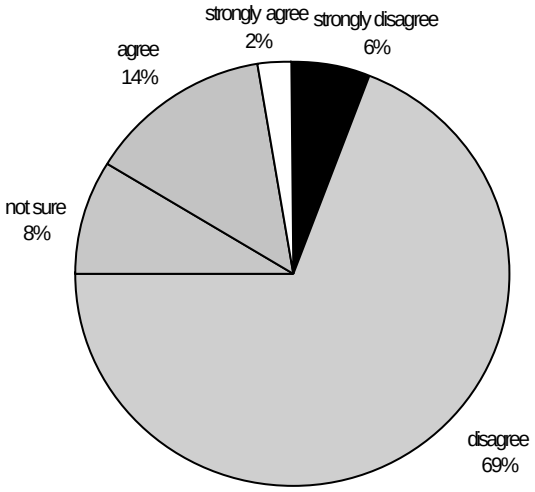


Figure 21
Percentage of GPs disagreeing that it was difficult to use the AID to diagnose disorder

How these responses varied in relation to the experience of the GPs using the AID is explored in Tables 24 to 26. As Disagree or Strongly Disagree implies that they felt it was not difficult to use, so the tables reflect this interpretation of the answers.

Table 24
Cases seen and ease of use

	easy	not easy
less than 3 cases per week	164	35
at least 3 cases per week	42	33

Table 25
Cases seen, ease of use and total years' clinical practice experience

	easy	not easy
less than 18 years	116	25
at least 18 years	90	43

Table 26
Cases seen, ease of use and total years' Occ. medicine experience

	easy	not easy
less than 1 year	134	45
at least 1 year	72	23

Analysis of Table 24 provides a highly significant indication that GPs who see fewer upper limb complaints would be more likely to feel the AID was not difficult to use (highly significant beyond the 1% level, Pearson correlation, p=0.00001). Further, analysis of Table 25 provides a highly significant indication that GPs with less total years' general practice found the AID was not difficult to use (beyond the 1% level, Pearson correlation, p=0.00517). There appears, however, not to be a significant relationship with occupational medicine experience (Table 26).

Figure 22 shows the percentage of GPs and the AID's ease of use to diagnose disorders, by disorder type (disagree or strongly disagree implies it was not difficult to use). From this, it appears that doctors were particularly likely find the AID not difficult to use for all disorders covered by the AID (at least 68% of cases for each). It is noticeable that the proportion was lowest for non-specific disorders.

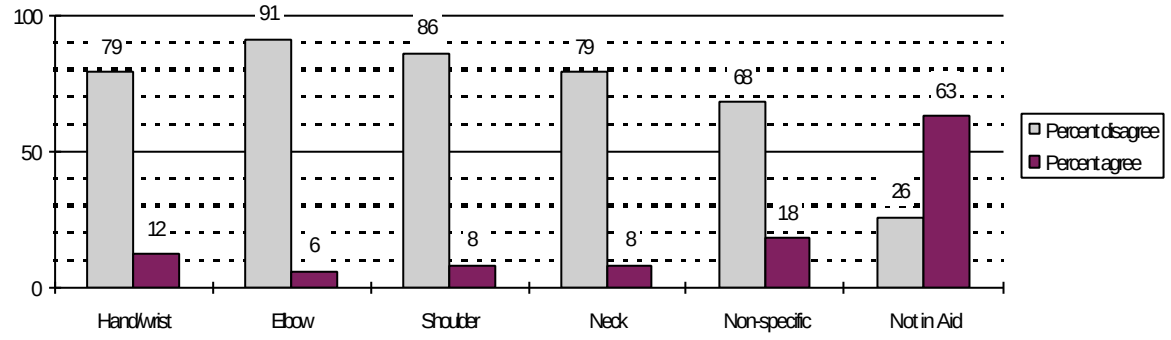


Figure 22
Percentage of GPs agreeing that it was not difficult to use the AID to diagnose disorder, by disorder type

4.6.2 OPs

Figure 23 shows the proportion of responses to the view that the AID was difficult to use for diagnosing an individual disorder. Disagree or Strongly Disagree implies

that they felt it was not difficult to use. OPs found the AID was not difficult to use on 205 (78%) occasions and difficult in 42 (16%) cases.

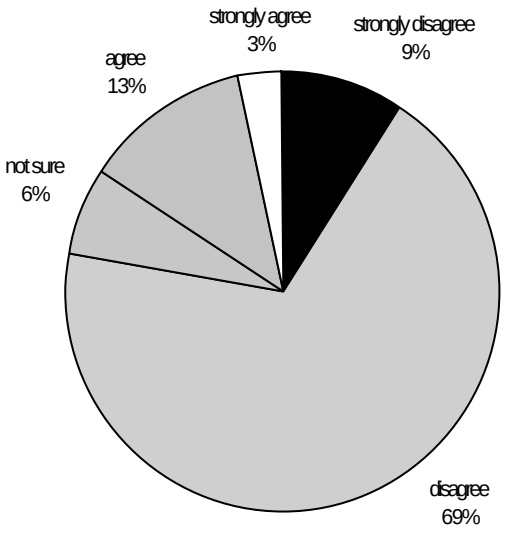


Figure 23
Percentage of OPs disagreeing that it was difficult to use the AID to diagnose disorder

How these responses vary in relation to the experience of the doctors using the AID is explored in Tables 27 to 29. As Disagree or Strongly Disagree implies that they felt it was not difficult to use, the tables reflect this interpretation of the answers.

Analysis of Table 27 shows that OPs who see fewer upper limb complaints were more likely to find the AID was not difficult to use. This was found to be significant beyond the 5% level (Pearson correlation, p=0.0496).

Meanwhile, the data in Tables 28 and 29 appear to show no influence of experience (either overall clinical or occupational medicine) upon the level of disagreement that the AID was difficult to use. This can be seen in either table by the fact that the proportion of agreements to disagreements is similar for each group.

Table 27
Cases seen and ease of use

	easy	not easy
less than one case per week	35	4
at least one case per week	170	55

Table 28
Cases seen, ease of use and total years' clinical practice experience

	easy	not easy
less than 20 years	103	29
at least 20 years	102	30

Table 29
Cases seen, ease of use and total years' Occ. medicine experience

	easy	not easy
less than 12 years	107	28
at least 12 years	98	31

Figure 24 shows how the OPs' perceptions that the AID's ease of use varies with

type of disorder. From this, it appears that doctors were particularly likely to find the AID was not difficult to use for all specific disorders covered by the AID (at least 85% of cases for each). OPs found it slightly more difficult to use for non-specific disorders (74%).

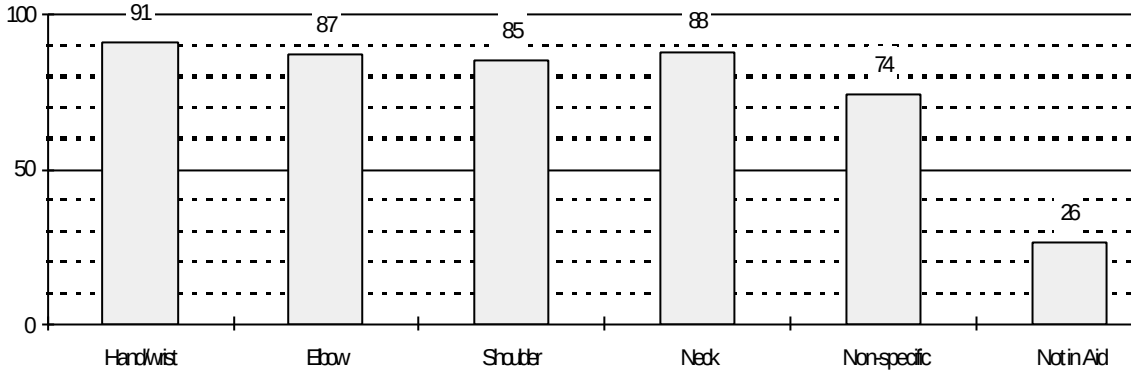


Figure 24
Percentage of OPs agreeing that it was not difficult to use the AID to diagnose disorder, by disorder type

4.7 SUPPORT FOR JUDGING WORK-RELATEDNESS

4.7.1 GPs

Figure 25 shows the proportion of responses to the assertion that the AID helped the doctor reach a more accurate diagnosis. GPs agreed that the AID was useful for judging work-relatedness on 99 (35%) occasions and disagreed in 125 (44%) cases.

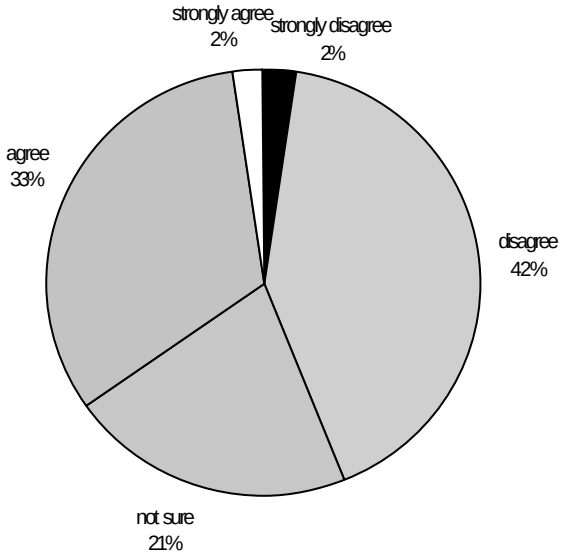


Figure 25
Percentage of GPs agreeing that the AID was useful for judging work-relatedness

How these responses vary in relation to the experience of the doctors using the AID is explored in Tables 30 to 32.

Table 30
AID useful for judging work-relatedness and number of cases

	agree	not agree
less than 3 cases per week	85	114
at least 3 cases per week	13	62

Table 31
AID useful for judging work-relatedness and years' general practice experience

	agree	not agree
less than 18 years	59	82
at least 18 years	39	94

Table 32
AID useful for judging work-relatedness and total years' Occ. medicine experience

	agree	not agree
less than 1 year	53	126
at least 1 year	45	50

Analysis of the data in Table 30 shows that GPs who saw fewer upper limb complaints were more likely to agree that the AID was useful for judging work-relatedness. This was found to be highly significant beyond the 1% level (Pearson correlation, p=0.00009).

In addition, the data analysis of Table 31 indicates that GPs with less total years' general practice experience might be more likely to agree that the AID was useful for judging work-relatedness. This was found to be significant beyond the 5% level (Pearson correlation, p=0.0307). In a similar way, analysis of Table 32 shows a highly significant possibility that GPs with more years' occupational medicine experience might be more likely to agree that the AID helped judge work-relatedness. This was found to be significant beyond the 1% level ((Pearson correlation, p=0.00351).

Figure 26 shows the percentage of GPs agreeing that the AID was useful for judging work-relatedness by disorder type. From this, it is clear that the proportion of agreements was less than 50% for all categories of disorder. GPs were more likely to agree than disagree that the AID helped in judging work-relatedness for non-specific disorders and specific neck disorders covered by the AID.

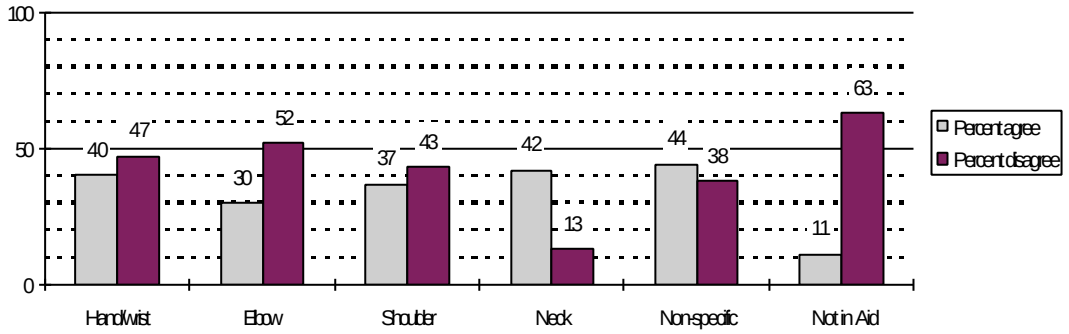


Figure 26
Percentage of GPs agreeing that the AID was useful for judging work-relatedness by disorder type

4.7.2 OPs

Figure 27 shows the proportion of responses to the view that the AID helped the doctor reach a more accurate diagnosis. OPs agreed that the AID was useful for judging work-relatedness on 144 (54%) occasions and disagreed in 68 (26%) cases.

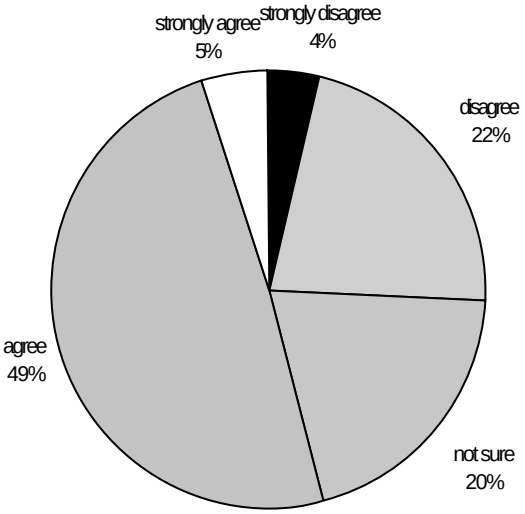


Figure 27
Percentage of OPs agreeing that the AID was useful for judging work-relatedness

How these responses vary in relation to the experience of the doctors using the AID is explored in Tables 33 to 35.

Table 33
AID useful for judging work-relatedness and number of cases

	agree	not agree
less than one case per week	18	21
at least one case per week	126	99

Table 34
AID useful for judging work-relatedness and total years' clinical experience

	agree	not agree
less than 20 years	60	72
at least 20 years	84	48

Table 35
AID useful for judging work-relatedness and total years' Occ. medicine experience

	agree	not agree
less than 12 years	62	73
at least 12 years	82	47

From analysis of Table 33 it does not seem that OPs who see more upper limb complaints were more likely to agree that the AID was useful for judging work-relatedness (Pearson correlation, non-significant ($p = 0.254$).

The analysis of the data in Table 34 shows that OPs with more total years' clinical experience are more likely to find the AID useful for judging work-relatedness. This was found to be significant beyond the 1% level (Pearson correlation, $p=0.00301$).

Similarly, OPs with more years' occupational medicine experience were more likely to agree that the AID helped judge work-relatedness (Table 35). This trend was found to be significant beyond the 1% level (p=0.00401).

Figure 28 shows the percentage of OPs agreeing that the AID was useful for judging work-relatedness by disorder type. From this, it is clear that OPs were more likely to agree that the AID was useful for judging work-relatedness for all specific and non-specific disorders covered by the AID.

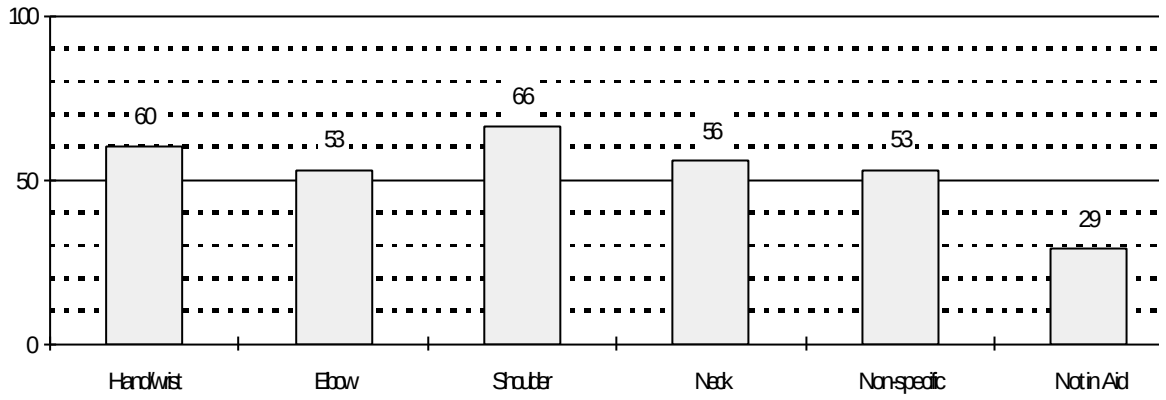


Figure 28
Percentage of OPs agreeing that the AID was useful for judging work-relatedness by disorder type

4.8 SUPPORT FOR PLANNING DISORDER MANAGEMENT

4.8.1 GPs

Figure 29 shows the proportion of responses to the view that the prompts on the AID supported the doctor's management plan. GPs agreed that the AID was supported management on 117 (41%) occasions and disagreed in 120 (42%) cases.

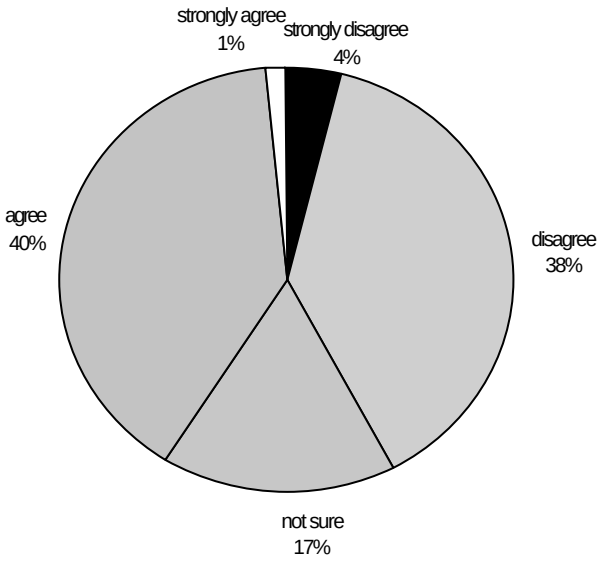


Figure 29
Percentage of GPs agreeing that management plan was supported by AID

How these responses vary in relation to the experience of the doctors using the AID is explored by Tables 36 to 38. GPs who see fewer upper limb complaints at work do not appear more likely to agree that the AID supported disorder management (Table 36, non-significant (p=0.0753).

Analysis of Table 37 shows that GPs with more total years' general practice experience were more likely to agree that the AID supported disorder management. This association was found to be significant beyond the 5% level (Pearson correlation, p=0.0246). GPs with more years' occupational medicine experience are not more likely to agree that the AID supported disorder management (Table 38, non-significant, p=0.115).

Table 36
Agreement AID supported GP's management plan and number of cases

	agree	not agree
less than 3 cases per week	90	109
at least 3 cases per week	25	50

Table 37
Agreement AID supported GP's management plan and total years' general practice experience

	agree	not agree
less than 18 years	50	91
at least 18 years	65	68

Table 38
Agreement AID supported the GP's management plan and years' Occ. medicine experience

	agree	not agree
less than 1 year	69	110
at least 1 year	46	49

Figure 30 shows the percentage of OPs agreeing that the AID supported their management plans. From this, it is clear that OPs were more likely to agree than

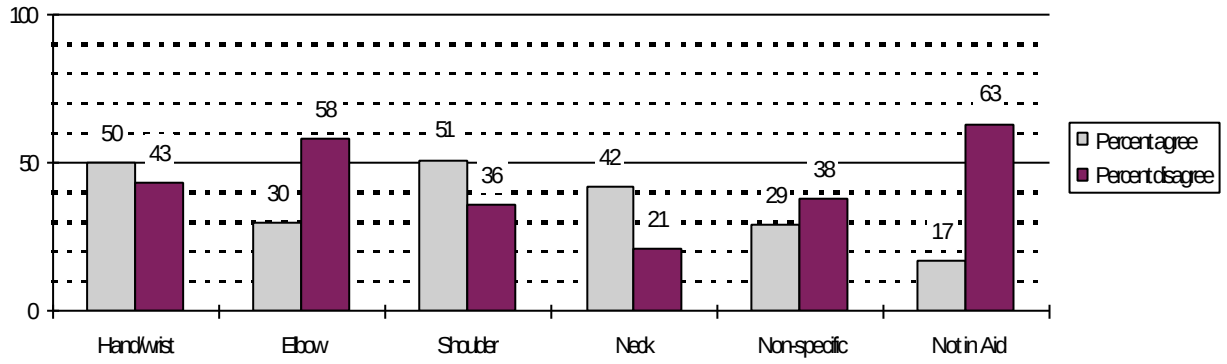


Figure 30
Percentage of GPs agreeing that management plan was supported by AID by disorder type

disagree that the AID supported management for specific disorders of the hand/wrist, shoulder and neck. This trend was reversed for non-specific disorders and specific elbow disorders.

4.8.2 OPs

Figure 31 shows the proportion of responses to the view that the prompts on the

AID supported the OP's management plan. OPs agreed that the AID supported management on 125 (47%) occasions and disagreed in 86 (33%) cases.

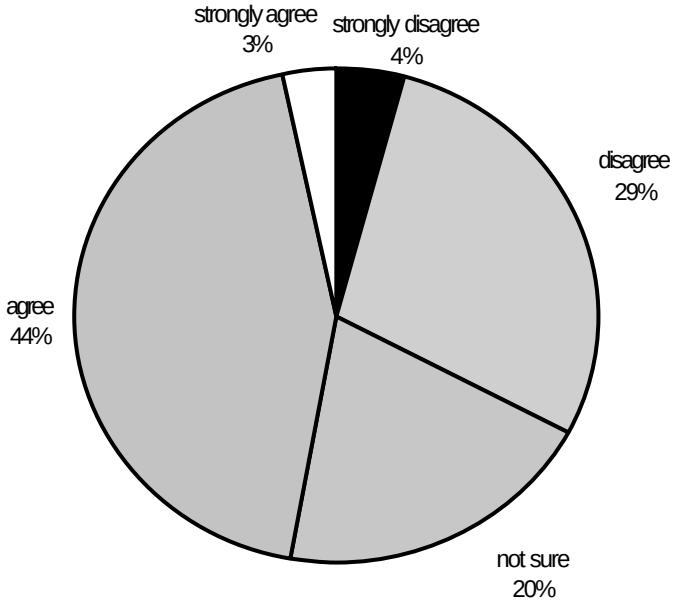


Figure 31
Percentage of OPs agreeing that management plan was supported by AID

How these responses vary in relation to the experience of the doctors using the AID is shown in Tables 39 to 41. Table 39 appears to show no influence of frequency of dealing with upper limb complaints upon the level of agreement that the prompts on the AID supported the doctor's management plan for a disorder. This can be seen by the fact that the proportion of agreements to disagreements is similar for each group.

Table 40 indicates that OPs with more total years' clinical experience are more likely to agree that the AID supported disorder management. This was found to be significant beyond the 1% level (Pearson correlation, p=0.00458). OPs with more years' occupational medicine experience (Table 41) were not more likely to agree that the AID supported disorder management (non-significant, p = 0.0879).

Table 39
Agreement that AID supported the OP's management plan and number of cases

	agree	not agree
less than one case per week	18	21
at least one case per week	107	118

Table 40
Agreement AID supported the OP's management plan and total years' clinical experience

	agree	not agree
less than 20 years	51	81
at least 20 years	74	58

Table 41
Agreement AID supported OP's management plan and years' Occ. medicine experience

	agree	not agree
less than 12 years	57	78
at least 12 years	68	61

Figure 32 shows the percentage of OPs agreeing that the AID supported their management plans. From this, it is clear that OPs were more likely to agree that the AID supported management for specific disorders of the hand/wrist, elbow and shoulder. OPs were also more likely to agree (50%) than disagree (19%) for neck disorders, as well as non-specific disorders (50% agree and 32% disagree).

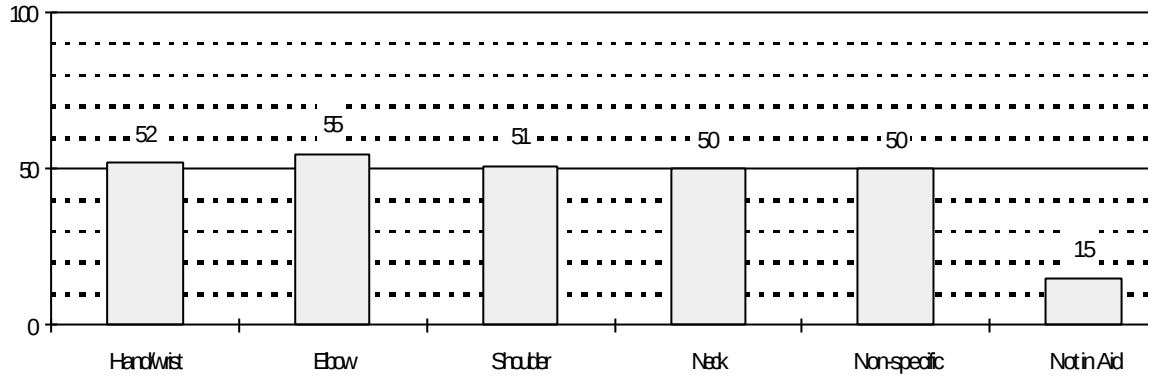


Figure 32
Percentage of OPs agreeing that management plan was supported by AID by disorder type

4.9 FUTURE DESIGN OF AID

4.9.1 GPs

The post-trials questionnaire was completed by 33 GPs. It covered issues about the AID's overall usability, concentrating on aspects of its design and presentation. These issues were dealt with using statements with which subjects indicated their level of agreement on a five-point scale. Along with each statement, space was provided for subjects to suggest improvements. It was intended that suggestions would be prioritised according to the level of agreement with the associated statement, and will ultimately be used to decide on the final design of the AID.

The level of agreement with each statement is summarised in Table 42. Statements 3 and 5 to 12 involved positive statements about the AID's merits, whereas statement 4 gave a negative inference. It is clear from Table 42 that a high level of agreement is universal with the positive statements (ranging between 78% and 94%) and there is a high level of disagreement with the negative statement (69%). This would make it difficult to place much emphasis on any suggestions for changing the AID in relation to the issues covered by statements 3 to 15. Therefore, suggested changes to the AID written by GPs in relation to these statements were not prioritised by level of agreement, as originally intended. Instead all recommendations have been considered with equal merit.

Statements 16 and 17 dealt with ideas for changing the presentation and overall information content of the AID. Agreement with these statements was variable and, in particular, it appears that GPs would like to see:

a) Colour coding of the AID to make cross-referencing easier
b) Lamination of Parts A, B & C of the AID
c) Production of the AID in a fold-out format, suitable to be kept in a drawer

d) Reference document with additional information to confirm diagnosis
e) Literature references on the AID for doctors who want more information
f) Supplementary document (e.g. diagrams) to support physical examination
g) Additional information on work-related physical risk factors

Due to limited resources, these ideas will not be incorporated into the version of the AID used for the evaluation study, but should be considered when the final version of the AID is published.

Table 42
Percentage of GPs who agreed with statements about the AID

Statement	Agreement
(3) Part A clearly directed me to the appropriate section of the AID.	94%
(4) Part A should be changed as it is of limited use in its current form.	19% (69% disagree)
(5) The symptoms and signs given in column 1 of Part B of the AID make it easy to differentiate initially between syndromes.	89%
(6) The symptoms and signs given in column 1 of Part C of the AID make it easy to differentiate initially between syndromes.	89%
(7) The disorders are listed in a useful order in Part B of the AID which allows the process of elimination to flow logically.	89%
(8) The disorders are listed in a useful order in Part C of the AID which allows the process of elimination to flow logically.	82%
(9) The AID covers an appropriate choice of syndromes to provide diagnostic support for a variety of complaints.	85%
(10) The cross-referencing between disorders on the AID (e.g. “Check” arrows between shoulder disorders, or “Check for” prompts in column 2) allows a comprehensive check to be made for disorders with overlapping symptoms.	80%
(11) The action-related risk factors given in column 3 of Parts B & C are useful when considering how to deal with the causes of a disorder.	81%
(12) The confirmatory signs in column 4 of Parts B & C are comprehensive enough to support a differential diagnosis.	78%
(16) The following are important features of how the final version of the AID should be packaged:	
a) Colour coding of the AID to make cross-referencing easier	82%
b) Attachment of index tabs to pages in the AID to support cross-referencing	35%
c) Lamination of Parts A, B & C of the AID	86%
d) Production of the AID in a fold-out format, suitable to be kept in a drawer	69%
e) Provision of check boxes on the AID for note-making during a consultation	42%
(17) The following would be useful additions to the final version of the AID:	
a) Reference document with additional information to confirm diagnosis	72%
b) Literature references on the AID for doctors who want more information	65%
c) Supplementary document (e.g. diagrams) to support physical examination	78%
d) Additional information on work-related physical risk factors	69%
e) Supplementary information on psychosocial risk factors	41%

Suggestions for improvements to the AID which were obtained by questionnaire were collated and summarised for discussion with members of the Project Steering Group. Discussions generated a set of recommendations for changes to the diagnostic AID and its accompanying training package. These recommendations are listed on the next page.

Suggested modifications to the AID included:

1. Consider removing "(NOT referred)" from the decision box on Part A of the AID. This is due to the difficulty expressing concisely at this point in the AID what is meant by "referred" and how to decide when a pain is referred. Examples of referred pain provided within the General Systems Review box should give the necessary support when deciding whether to use the AID further.
2. Where possible, action-related risk factors should be complemented by examples of every-day actions. This should simplify the meaning of terminology which may not be part of a GP's daily vocabulary.
3. Phalen's test should replace Tinel's test on Part B of the AID for confirming Carpal Tunnel Syndrome. This is supported by the findings of the Harrington study, which indicated by consensus that Phalen's test is preferred to Tinel's test as a criterion for diagnosis.
4. The heading in Part C should be changed to refer to pain in "elbow, shoulder or neck" rather than in "elbow or upper arm". This is because, as one GP pointed out, the "first question on Part C asks about pain in shoulder or neck," but it is not explicit that "upper arm" includes specifically shoulder and neck.
5. An attempt should be made to increase the size of the writing on the AID, if this can be achieved without changing with the AID's overall flow and layout to the extent of impacting upon its usability and effectiveness. Two GPs requested that the writing on the AID should be made bigger. Another questioned whether the information on the AID needed to be contained within boxes and diamonds.

Some of these recommendations were incorporated into a new draft version of the diagnostic AID. The suggestions for improving the AID's accompanying training package are given below.

1. Emphasise the point in the training package that although on first appearances the AID may appear complex, it is actually straightforward to use. According to one GP, "Initially it seemed quite overwhelming but was actually very easy to use." Another GP stated that the AID "looks very laboured and complicated even though it is not really".
2. Make clear in the training package what is meant by "referred pain" in Part A of the AID. (One option would be to include a Glossary of Terms in the training package). It is intended that Part A should guide users to use the AID further if and only if symptoms include musculoskeletal pain in the upper limb, which is <u>not referred</u> (i.e. not associated with Angina Pectoris or Oesophagitis). At least three GPs erroneously felt that referred pain in this instance could also include neurological symptoms from the likes of Cervical Spondylosis.
3. A clear specification of the types of disorders and even types of patients for which the AID is to be used is required in the training package. This should help to deal with the situations encountered where doctors tried to use the AID e.g. (a) for acute trauma injuries (b) for patients of non-working age or (c) for second consultations.
4. The training package should explain what is meant by (a) mid-range of shoulder movement and (b) elevation of the shoulder. This was requested by one GP and it is possible that many GPs will not be familiar with these descriptions.

Various ideas for extending the role of a medical assessment AID were suggested by GPs. The implications of these need to be addressed by the HSE, possibly as part of

separate projects to develop decision support of disorder diagnosis and management. The ideas included:

1. Details of further investigations which should be carried out to confirm a diagnosis (e.g. for Carpal Tunnel Syndrome, nerve conduction studies or MRI scans).
2. Decision support to distinguish neurological symptoms referred from the neck, from those of more peripheral nerves (where a doctor has reached an initial diagnosis of Carpal Tunnel Syndrome or Cervical Spondylosis, the current AID directs the doctor to differentiate between the two without providing further support).
3. Supplementary information should be provided on treatment options (one GP indicates that at a simple level, this could involve the decision “if there is pain here, then inject here”).
4. Diagrams could be essential for many GPs to describe important anatomical landmarks for examination and consultation (e.g. for Carpal Tunnel Syndrome, many GPs will need to be shown the sensory distribution of the median nerve).

4.9.2 OPs

A similar analysis to that undertaken for the GPs was carried out for the OPs.

The level of agreement with each statement is summarised in Table 43. Statements 3 and 5 to 15 involved positive statements about the AID’s merits, whereas statement 4 gave a negative inference. It is clear from Table 43 that a high level of agreement is universal with the positive statements (ranging between 81% and 97%) and there is a high level of disagreement with the negative statement (71%). This would make it difficult to place much emphasis on any suggestions for changing the AID in relation to the issues covered by statements 3 to 15. Therefore, suggested changes to the AID written by OPs in relation to these statements were not prioritised by level of agreement, as originally intended. Instead all recommendations have been considered with equal merit.

Statements 16 and 17 dealt with ideas for changing the presentation and overall information content of the AID. Agreement with these statements was variable and, in particular, it appears that OPs would like to see:

a) Colour coding of Parts A, B, C, D & E of the AID to make cross-referencing easier
b) Attachment of index tabs to pages in Parts D & E to support cross-referencing
c) Lamination of Parts A, B & C of the AID
d) Literature references on the AID for doctors who want more information
e) Supplementary document (e.g. diagrams) to support physical examination
f) Additional information on work-related physical risk factors
g) Supplementary information on psychosocial risk factors

Due to limited resources, these ideas were not incorporated into the version of the AID used for the evaluation study, but should be considered when the final version of the AID is published.

Suggestions for improvements to the AID which were obtained by questionnaire

were collated and summarised for discussion with members of the Project Steering Group. Discussions generated a set of recommendations for changes to the diagnostic AID and its accompanying training package. These recommendations are listed below Table 43.

Table 43
Percentage of Occupational Physicians who agreed with statements about the AID

Statement	Agreement
(3) Part A clearly directed me to the appropriate section of the AID.	90%
(4) Part A should be changed as it is of limited use in its current form.	13% (71% disagree)
(5) The symptoms and signs given in column 1 of Part B of the AID make it easy to differentiate initially between syndromes.	94%
(6) The symptoms and signs given in column 1 of Part C of the AID make it easy to differentiate initially between syndromes.	94%
(7) The disorders are listed in a useful order in Part B of the AID which allows the process of elimination to flow logically.	87%
(8) The disorders are listed in a useful order in Part C of the AID which allows the process of elimination to flow logically.	87%
(9) The AID covers an appropriate choice of syndromes to provide diagnostic support for a variety of complaints.	87%
(10) The cross-referencing between disorders on the AID (e.g. “Check” arrows between shoulder disorders, or “Check for” prompts in column 2) allows a comprehensive check to be made for disorders with overlapping symptoms.	81%
(11) The action-related risk factors given in column 3 of Parts B & C are useful when considering how to deal with the causes of a disorder.	84%
(12) The confirmatory signs in column 4 of Parts B & C are comprehensive enough to support a differential diagnosis.	84%
(13) The layout of Parts D & E make them easy to use.	90%
(14) Parts D & E contain sufficient symptoms and signs to help in the confirmation of a diagnosis.	97%
(15) The risk factors listed in Parts D & E are a useful source of reference when considering how to deal with the causes of a disorder.	94%
(16) The following are important features of how the final version of the AID should be packaged:	
a) Colour coding of Parts A, B, C, D & E of the AID to make cross-referencing easier	81%
b) Attachment of index tabs to pages in Parts D & E to support cross-referencing	77%
c) Lamination of Parts A, B & C of the AID	87%
d) Production of the AID in a fold-out format, suitable to be kept in a drawer	42%
e) Provision of check boxes on the AID for note-making during a consultation	29%
(17) The following would be useful additions to the final version of the AID:	
a) Literature references on the AID for doctors who want more information	80%
b) Supplementary document (e.g. diagrams) to support physical examination	77%
c) Additional information on work-related physical risk factors	71%
d) Supplementary information on psychosocial risk factors	68%

Suggested modifications to the AID included:

1. The AID should acknowledge Raynaud’s Syndrome and Vibration White Finger as separate entities. This will merely involve replacing any reference on the AID to “Raynaud’s Syndrome” with “Raynaud’s Syndrome / Vibration White Finger” and modifying the risk factors list in Part D of the AID to indicate that Vibration White

Finger is associated with history of using vibrating tools. This is to deal with the fact that the conditions should be reported separately under RIDDOR.

2. The findings of the Harrington (1997) study should be examined in relation to the reliability of Phalen's test as opposed to Tinel's for Carpal Tunnel Syndrome. This could decide whether Phalen's test should replace Tinel's on Part B of the AID. A check should also be made on whether the symptoms and signs on the AID for De Quervain's Disease correlate with Harrington's (op cit.) findings. A check should be made on whether the Harrington (op cit.) study indicates that Cervical Spondylosis is a radiological diagnosis only. One doctor suggested that it is and that the label "Osteo-arthritis of the neck" should be used instead.
3. Part C of the AID needs to include diagnosis options for Osteo-Arthritis of the elbow, shoulder, and possibly neck (although the latter may be encompassed in Cervical Spondylosis). This is to reflect the fact that similar provision has been made for this type of disorder in Part B.
4. The implication on the AID that Cervical Spondylosis is "rare in under age 40 group" should be softened by using words such as "less common...". It seems that such patterns may not be reflected in the experience of individual doctors.
5. Whether the risk factors in Parts D and E could be put in a more logical structure should be looked into.
6. The emphasis on cross-referencing from Parts B and C to Parts D and E should be improved. This includes making the pointers (given in Parts B and C) to page numbers take greater prominence. Also, Parts D and E should have headers throughout in relation to "Hand, Wrist & Forearm" and "Neck, Shoulder & Elbow", respectively.
7. Consistent terminology should be used in the AID, e.g. the word "radiological" should be used as opposed to "roentgen" in the confirmatory signs in Part D for arthritis.
8. "Family History" should be included as a risk factor of Rheumatoid Arthritis in Part D.

Some of these recommendations were incorporated into a new draft version of the diagnostic AID. The suggestions for improving the AID's accompanying training package are given below.

1. The AID should be referred to as a diagnostic AID as opposed to a medical assessment AID. This is to clarify that its prime objective is to help with diagnostic decision making, rather than the management of disorders.
2. A clear specification of the types of disorders to be covered by the AID is required in the training package. This should help to deal with the situations encountered where doctors tried to use the AID for acute trauma injuries or dermatological problems.
3. A clear definition of the rationale behind each "non-specific" diagnosis is needed. It appears that some doctors needed clarification in relation to why this terminology has been used and on what occasions such a diagnosis is appropriate.
4. The training package should include an explanation of the rationale behind the sequencing of disorders on the AID. Two doctors indicated that neck and shoulders should be examined before moving down the arm. However, the AID avoids this order so that the process of elimination can begin with more specific disorders and end with broader categories such as "diffuse shoulder or neck pain".

5. The emphasis on cross-referencing from Parts B and C to Parts D and E should be improved. The training package should address the subject of the pointers in greater depth.

4.10 CONCLUSIONS

4.10.1 GPs

In summary, it appears that GPs found the AID to be effective: they felt that it increased their diagnostic accuracy on 42% of occasions and helped them to make a more informed decision for 52% of consultations. In addition, the usability of the AID was shown to be high, since doctors found no difficulty using it for 75% of consultations and thought the time taken to use it was acceptable for 51% (and not acceptable in 32%) of cases. Other benefits were that the AID was found to be useful for judging work relatedness in 35% of cases and supported the doctors' management plan on 41% of occasions.

The percentage of positive statements about the AID in relation to each of the above issues was generally greater for shoulder and neck, than for hand and wrist problems. This is an important result when considering that specific disorders of the shoulder and neck made up 55% of the cases for which the GPs used the AID in this study.

Furthermore, the proportion of positive responses for most of the issues examined was greater for shoulder, neck, hand and wrist conditions than for elbow disorders. A reasonable explanation of this trend is that the elbow conditions covered by the AID are relatively straightforward to diagnose, such that a diagnostic AID may not be expected to provide useful support. In fact, for 64% of elbow disorders doctors agreed with the statement "A flowchart diagnostic AID could not be expected to refine my initial working diagnosis for this disorder." This level of agreement was higher than for any other type of disorder.

What is most interesting about the proportion of positive statements for different types of condition is that the response is generally good for non-specific disorders (i.e. for issues concerning the accuracy and information provided for diagnosis, a higher level of agreement was reached than for hand/wrist problems). This is especially encouraging since it is thought that non-specific problems make up a large proportion of the upper limb complaints with which doctors must deal on a daily basis.

The analysis also indicated that the usefulness of the AID varied according to the levels of experience of the doctors using it. The trends which were identified as significant are listed below:

a) GPs who see fewer upper limb complaints at work could be more likely to agree that the AID helped them to reach a more accurate diagnosis ($p<.01$), more likely to agree that the time taken to use the AID was acceptable ($p<.01$), more likely to disagree that the AID was difficult to use for a consultation ($p<.01$), and more likely to agree that the AID was useful for judging work-relatedness ($p<.01$)

b) GPs with fewer years' general practice experience might be more likely to agree

that the AID helped them to make a more informed decision about the diagnosis (p<.05), more likely to disagree that the AID was difficult to use for a consultation (p<.01), more likely to agree that the AID was useful for judging work-relatedness (p<.05), and less likely to agree that the AID supported disorder management (p<.05)

c) GPs with more years' occupational medicine experience might be more likely to agree that the AID helped them to reach a more accurate diagnosis (p<.01), more likely to agree that the AID helped them to make a more informed decision about the diagnosis (p<.05), more likely to agree that the time taken to use the AID was acceptable (p<.01), and more likely to agree that the AID was useful for judging work-relatedness (p<.01)

4.10.2 OPs

In summary, it appears that OPs found the AID to be effective: they felt that it increased their diagnostic accuracy on 55% of occasions and helped them to make a more informed decision for 74% of consultations. In addition, the usability of the AID was shown to be high, since doctors found no difficulty using it for 78% of consultations and thought the time taken to use it was acceptable for 82% of cases. Other benefits were that the AID was found to be useful for judging work relatedness in 54% of cases and supported the doctors' management plan on 47% of occasions.

The percentage of positive statements about the AID in relation to each of the above issues was generally greater for shoulder, neck, hand and wrist problems, than for elbow disorders. A reasonable explanation of this trend is that the elbow conditions covered by the AID are relatively straightforward to diagnose, such that a diagnostic AID may not be expected to provide useful support. In fact, for 38% elbow disorders doctors agreed with the statement "A flowchart diagnostic AID could not be expected to refine my initial working diagnosis for this disorder." This level of agreement was higher than for any other type of disorder.

What is most interesting about the proportion of positive statements for different types of condition is that the response is generally good for non-specific disorders (a similar level of agreement to that for hand/wrist problems). This is especially encouraging since non-specific conditions might be more of a problem in diagnosing upper limb complaints.

The analysis also indicated that the usefulness of the AID varied according to the levels of experience of the doctors using it. The trends which were identified as significant are listed below:

a) OPs who see more upper limb complaints at work could be more likely to agree that the AID helped them to reach a more accurate diagnosis (p<.05) and more likely to disagree that the AID was difficult to use for a consultation (p<.05)

b) OPs with more total years' clinical experience might be more likely to agree that the AID was useful for judging work-relatedness (p<.01) and more likely to agree that the AID supported disorder management (p<.01)

c) OPs with more years' occupational medicine experience might be more likely to agree that the AID was useful for judging work-relatedness (p<.01).

5. EVALUATION OF THE DIAGNOSTIC SUPPORT AID IN SIMULATED CONSULTATIONS

5.1 INTRODUCTION

5.1.1 Background

The aim of this part of the study was to evaluate the effectiveness of the new versions of the GPs' and OPs' Diagnostic Support Aids for ULDs (DSAID-ULDs) or AID. This was an experimental study with one group of OPs and GPs using the AID (experimental group) and the other not using it (control group).

Members of the experimental group were instructed prior to the assessments in use of the AID and supplementary document(s), and were required to use these during the assessment. Members of the control group carried out the assessment in their usual way.

Conditions such as time constraints were set as close as possible to those of a normal consultation. This was to allow the performance of each group to be compared, and hence provide an indication of the effectiveness of the AID and supplementary document(s).

Originally it was intended to use two equal-sized groups of GPs and OPs (independent of those involved in the first experimental study). Each GP group was to be around 15 (30 in total), and each OP group around 15 in size (30 in total). In each case this was to provide a minimum size for control and experimental groups.

Although a substantial number of invitations were sent to both GPs and OPs, the response rate was poor so the target size of experimental and control groups was not achieved within the project timescales. This meant that the data had to be combined where possible. In this document, the term "Practitioner" refers generally to both OPs and GPs. A slightly different AID was developed for OPs and each AID was evaluated by the relevant set of doctors. The AID for OPs was identical to the GPs except it contained additional parts to help the OP with further diagnosis.

5.1.2 Aim and Research Questions

The aim of this part of the study was to evaluate the effectiveness of the new versions of the GPs' and OPs' AID. This involved attempting to answer the following research questions.

a) Is the Practitioner more likely to reach a correct diagnosis with the support of the diagnostic AID, than without?
b) Does the AID provide greater support for particular types of disorder, than for others?

It was accepted that subject numbers might be too low to produce a conclusive answer in relation to the extra questions posed to the OPs which dealt with the supporting material.

5.2 APPROACH

5.2.1 Study design

One half of the OPs formed an experimental group and were sent a self-training package on how to use the AID. They then undertook 10-minute consultations with 10 Standardised Patients (played by actors) under simulated medical assessment conditions, with the support of the AID. The remaining half of the OPs made up a control group and undertook 10-minute consultations with each of the Standardised Patients, without using the AID. Similarly, GPs were assigned to an experimental group and the other half to a control group. Each doctor was required to see the same set of Standardised Patients.

With the time and recruiting constraints, considerable background work was undertaken in the study design, and detailed discussions of other design options were undertaken with university statistical help before the final design was accepted.

5.2.2 Recruitment

Occupational Physicians were recruited from major centres, principally around the Scottish central belt, and Grampian. These locations were determined by logistic constraints. In total, 7 OPs were available to participate in the study out of around 50 invited to take part.

General Practitioners were recruited from the areas where there were OP participants, so that trial evenings could be located where a reasonable number of doctors were able to attend. Most of the recruitment was around the Glasgow area for logistic reasons. Overall, 15 GPs were able to participate in the study out of over 700 invited to take part.

5.2.3 Procedure

Once recruited, each subject was required to complete a pre-trial questionnaire (see Appendix 4.A). This covered issues of the doctor's knowledge and experience of upper limb disorders, and produced an overall profile of characteristics which may affect the doctor's unaided performance in diagnosing these conditions. The profile was used to allocate doctors to either an experimental group or a control group, such that each group was balanced in terms of the characteristics of its members. It was intended that each group should contain the same number of OPs and also the same number of GPs.

The experimental group subjects were sent the AID and training package, and were required to learn to use the AID. The subjects from the experimental group were instructed not to share information about the AID with any of the control subjects throughout the period of the trials.

Once the recruitment of Practitioners and Standardised Patients was completed, trials were conducted on weekday evenings at locations by prior arrangement with each Practitioner. Each OP was required to undertake a 10 minute consultation (5 to 8 minutes for GPs) with each of the 10 Standardised Patients under simulated conditions either with (experimental group) or without (control group) the support

of the diagnostic AID. Each Practitioner's set of consultations was run in parallel with other Practitioners to make the most effective use of resources.

Subjects were placed in trial groups (not related to membership of either experimental or control groups) with a maximum size of five, according to their geographical location. Buildings which could be used to provide consultation rooms were identified for each location, bearing in mind that up to six rooms could be needed for an individual trial evening (one room for each doctor and a central waiting room).

The timetable for each trial evening was from 7 p.m. until 10 p.m., subject to agreement from participants. This allowed a maximum of 15 minutes for starting the trials, 15 minutes for each consultation, and 15 minutes break in the middle. This format was successful with the doctors who took part in the initial experimental studies. The sequence of consultations were randomised, as far as possible, while acknowledging the following constraints:

a) No pair of Standardised Patient roles played by one actor would be scheduled simultaneously.
b) No actor would be required to present two consecutive roles to one doctor.

Each doctor was required to record their diagnosis on a data collection form at the end of each consultation. Subjective views of the experimental group on the effectiveness and usability of the AID were recorded on questionnaires administered at the end of the trial evening (see Appendix 4.B).

5.2.4 Standardised Patients

Actors had to be recruited and trained to play the parts of 10 Standardised Patients prior to running the study trials. Preliminary enquiries were made to identify amateur drama groups around the Scottish central belt and contact was maintained with the actors previously used to play the part of Standardised Patients from the initial experimental study in the Grampian region.

Following the initial recruitment of OPs, it was apparent that it would be appropriate to use actors from the Glasgow area. It was also considered that when travel was required to undertake trials, the journey could be shared among the actors and researcher. This would mean that if an actor failed to appear on the evening of a trial, then alternative arrangements could be made prior to travelling to the location of the trials. A total of eight new actors were recruited to play the parts of Standardised Patients.

The participating actors were required to attend an introductory meeting at which the training packages were distributed and initial queries were addressed. Since five actors were recruited, each actor received two different self-training packages so that each of the 10 symptom cases was known by one actor.

This was done by allocating appropriate cases according to actor age and gender, as far as practicable. This meant that the failure of an actor showing for one of the trials would require the researcher to act as a replacement. This situation had not

occurred during the initial experimental studies, as all actors managed to attend as needed. The researcher made continued inquiries by telephone so that any learning difficulties experienced by the Standardised Patients could be identified and addressed.

The Standardised Patients were then formally assessed by a researcher using a structured proforma (see Section 2). The proforma was incorporated on a checklist evaluation sheet to be completed for each Standardised Patient case presented.

Actors were paired for the assessment process and separate evaluation appointments were made for each pair. Each actor was required to present two standardised case histories by role-playing with their assigned partners, taking the respective roles of patient and examiner. The presentation of the medical examiner role was not assessed. For each history presented the assessor used the checklist evaluation sheet to confirm that the presentation of symptoms and signs by each Standardised Patient met an acceptable standard.

5.2.5 Data Analysis

The data collection forms were examined to assess the correctness of each diagnosis in relation to each symptom history presented by the actors. The medical experts of the Project Steering Group were consulted where there was uncertainty about the correctness of a particular diagnosis.

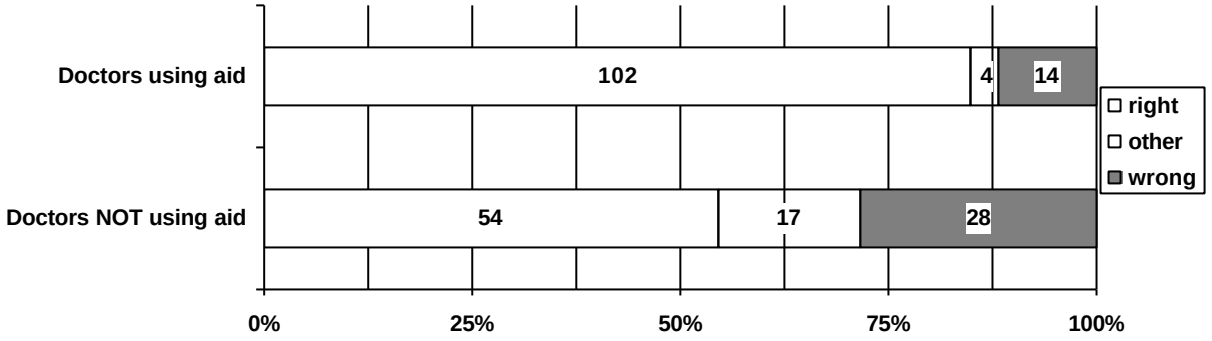
For both the experimental and control group, the percentage of diagnoses made correctly, wrongly or otherwise (e.g. not wrong but not specific enough to be categorised as correct) was calculated. From this, it was possible to make an initial comparison between the performances each group. This relationship was examined by descriptive statistics for Practitioners as a whole, as well as for OPs and GPs separately. In addition, the percentage of correct diagnoses were compared between experimental and control groups for each syndrome to show if the AID helped Practitioners diagnose particular disorders more accurately.

The percentage of correct, undecided and wrong diagnoses made by each group were compared using the Chi-square statistic. The test was used to assess whether the AID significantly increased the likelihood of correct, undecided or wrong diagnoses. Inferential analyses were used for Practitioners as a whole, because of the small sample size of subjects.

5.3 RESULTS

The study trials were completed by 8 GPs and 4 OPs who used their respective versions of the AID. A further 7 GPs and 3 OPs were used as control subjects for the study. Figure 33 shows the number of diagnoses which doctors (not differentiating between GPs or OPs) made correctly or incorrectly.

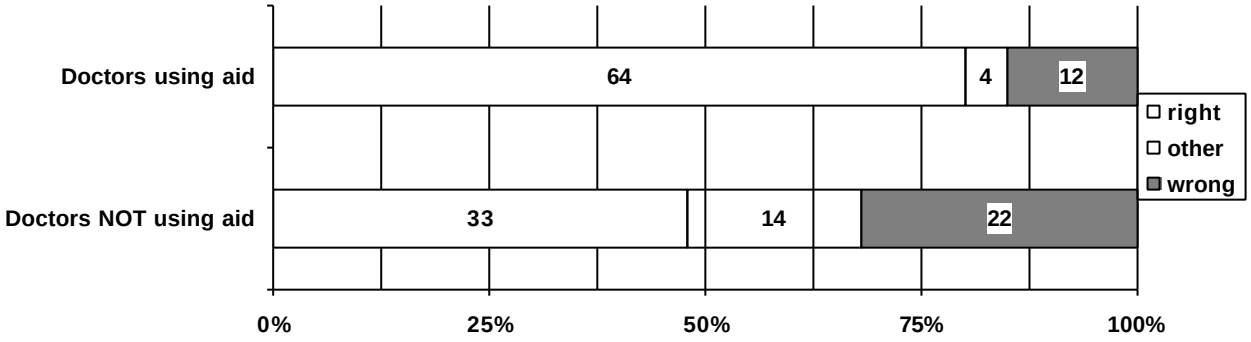
It can be seen from Figure 33 that use of the AID appears to be associated with an increase in the proportion of correct diagnoses (i.e. from 54.5% to 85.0%). Furthermore, the proportion of wrong diagnoses was shown to decrease (from 28.3% to 11.7%) when the AID was used.



The actual numbers of diagnoses (not percentages) are given on the bars.

Figure 33
Percentage of correct diagnoses made by doctors with or without the AID

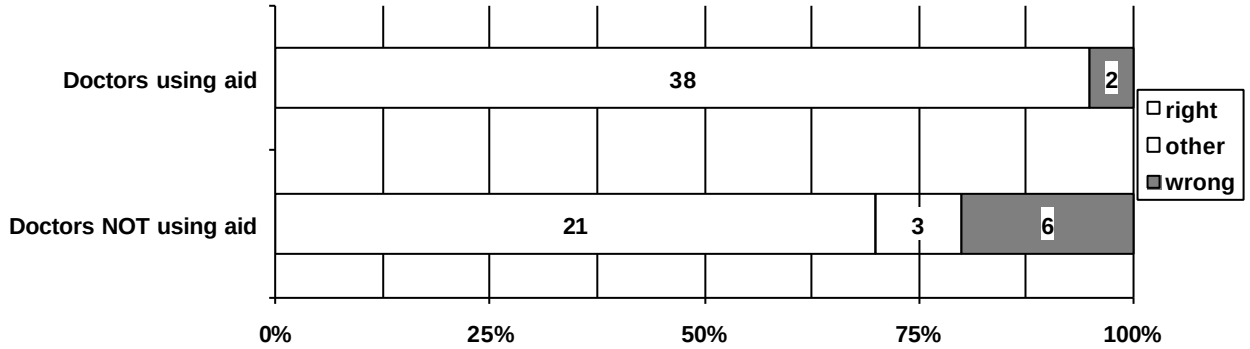
Figure 34 shows that these trends were echoed by GPs using the AID, although the strength of the relation appears to be slightly weaker. The proportion of diagnoses which were correct increased from 47.8% to 80.0%; and the proportion of wrong diagnoses decreased from 31.8% to 15.0%.



The actual numbers of diagnoses (not percentages) are given on the bars.

Figure 34
Percentage of correct diagnoses made by GPs with or without the AID

Finally, it appears from Figure 35 that the relation is again repeated for OPs, such that using the AID corresponds with an increase in the proportion of correct diagnoses from 70.0% to 95.0% and a decrease in wrong diagnoses from 20.0% to 5.0%.

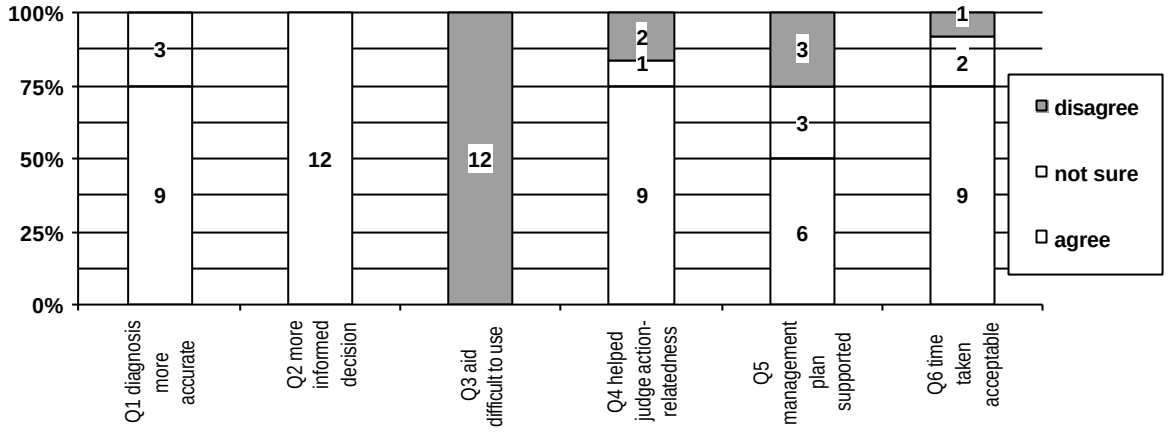


The actual numbers of diagnoses (not percentages) are given on the bars.

Figure 35
Percentage of correct diagnoses made by OPs with or without the AID

A Pearson Chi-square test was undertaken to confirm the association between using the AID and obtaining a correct (as opposed to wrong or other) diagnosis. Using the data for all the doctors, the test was highly significant (p=0.00000). Even though the number of doctors used provided a relatively small sample, results were also significant when the test was run for just GP data (p=0.00004) and for just OP data (p=0.00445).

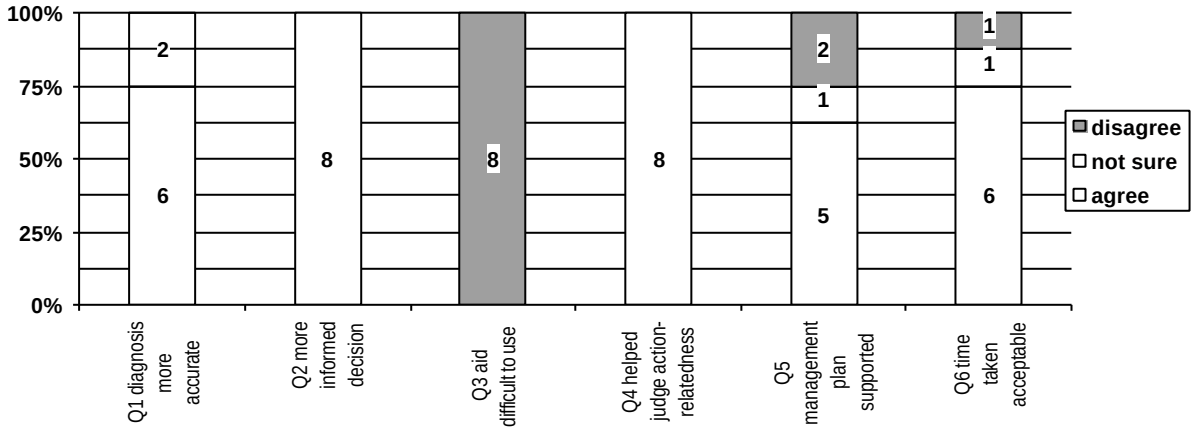
The post-trial questionnaire was completed by the 8 GPs and 4 OPs who used the AID and required them to indicate their level of agreement with various assertions about the usability and effectiveness of the AID. Figure 36 shows the proportion of responses by doctors to each assertion. The same issues were examined using purely GP data (Figure 37) and OP data (Figure 38).



The actual numbers of doctors (not percentages) are given on the bars.

Figure 36
Proportion of responses by doctors to various assertions about the AID

It is clear from Figure 36 that all doctors who used the AID in the trial felt that

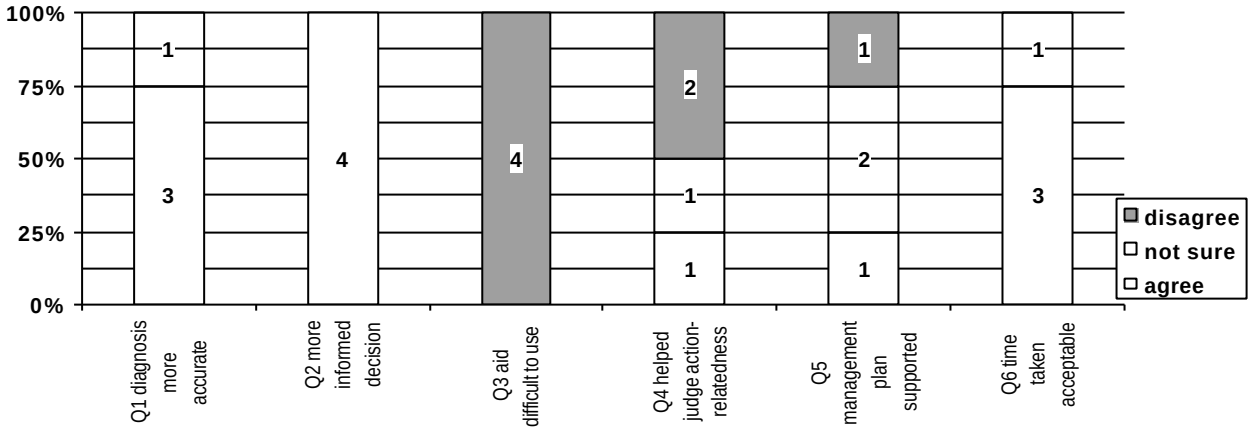


The actual numbers of doctors (not percentages) are given on the bars.

Figure 37
Proportion of responses by GPs to various assertions about the AID

the information in it had helped them to make a more informed decision about each diagnosis. In addition, three quarters of doctors felt that the AID had helped them to reach a more accurate diagnosis. It can be seen from Figures 37 and 38 that this statistic is the same for both GP and OP data.

It is also apparent that none of the doctors found it difficult to use the AID to diagnose disorders, and three quarters of both GPs and OPs felt that the time taken to use it was acceptable in view of its benefits to the consultation. Other benefits provided by the AID include the support it provides for judging the action-relatedness of disorders, and three quarters of doctors felt that it was useful in this respect. Figure 37 shows that the view that the AID was useful for judging action-relatedness was supported by all GPs. Finally, half of the doctors who used the AID indicated that it supported their management plan for disorders, while one quarter did not. The doctors who felt the AID helped in this respect included 62.5% of GPs and 1 out of 4 OPs.



The actual numbers of doctors (not percentages) are given on the bars.

Figure 38
Proportion of responses by OPs to various assertions about the AID

Table 44 summarises the number of correct diagnoses made for each of the test syndromes presented by Standardised Patients in the trials. It should be noted that it is difficult to draw general conclusions from these figures due to the small number of data involved. However, general trends emerge when the data is looked at as a whole. The performance of doctors in diagnosing each syndrome is further summarised in Figure 39 which shows the average diagnosis score for each syndrome: based on a score of 2 for right; 0 for wrong; and 1 for other.

It can be seen from Table 44 that the proportion of correct diagnoses was increased with using the AID for all syndromes except Lateral Epicondylitis (for which the unaided doctors left no room for improvement) and Shoulder Capsulitis. Nevertheless, doctors who used the AID to diagnose Shoulder Capsulitis were correct on 75% of occasions. In addition, with the exception of Lateral Epicondylitis and Shoulder Capsulitis, the number of wrong diagnoses was reduced with using the AID for all other syndromes.

Table 44
Number of right, wrong or other diagnoses made for each test syndrome by each group of doctors (unaided versus aided)

Group of doctors	Control (Unaided)			Experimental (Aided)		
Diagnosis	right	other	wrong	right	other	wrong
Flexor Tenosynovitis	3	1	6	8	0	4
Carpal Tunnel Syndrome	7	0	3	10	1	1
De Quervain's Disease	7	1	2	10	2	0
Lateral Epicondylitis	10	0	0	12	0	0
Shoulder Capsulitis	8	1	1	9	0	3
Supraspinatus tendonitis	6	1	3	12	0	0
Non-specific diffuse forearm pain	3	4	3	11	1	0
Cervical spondylosis	6	0	4	11	0	1
Diffuse neck/shoulder pain	2	7	1	11	0	1
Rheumatoid Arthritis of wrist	2	2	5	8	0	4

From Figure 39, it is clear that average diagnosis scores were relatively low for diagnosing certain syndromes without using the AID and that the AID could provide the needed support for these syndromes. This is true in particular for Rheumatoid Arthritis, Flexor Tenosynovitis, Non-specific diffuse forearm pain, Diffuse neck/shoulder pain and Cervical Spondylosis.

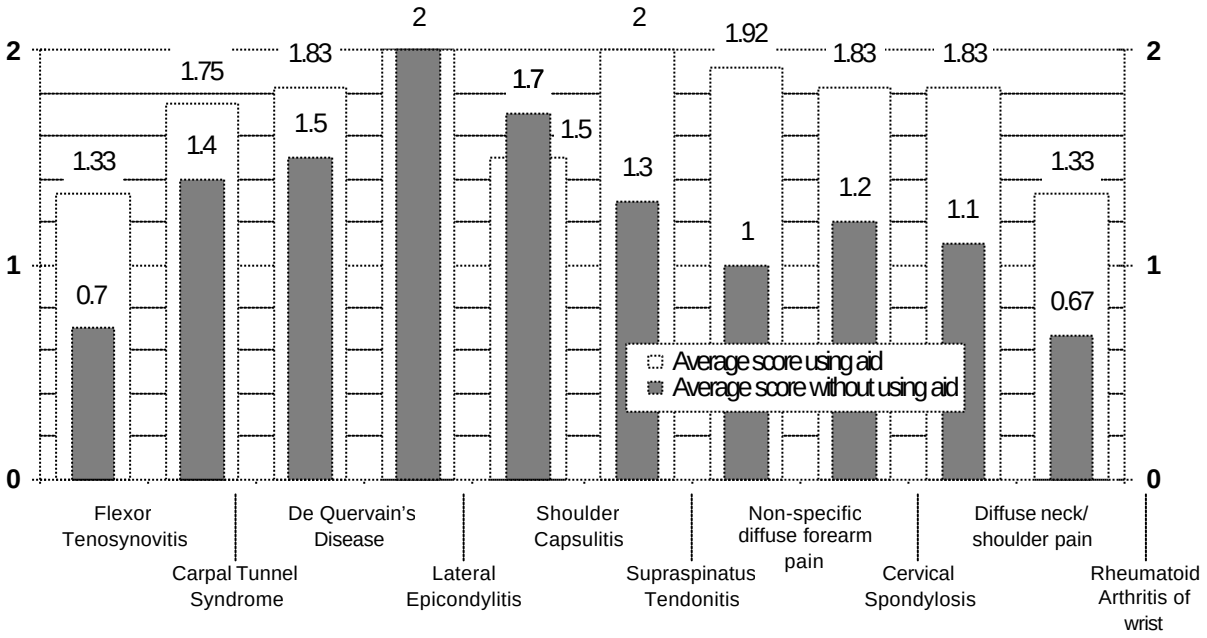


Figure 39
Average diagnosis score with or without using AID, grouped by syndrome

From the average scores when the AID was used, it is clear that there have been substantial increases for each of these syndromes. The only reduced score when the AID was used involved Shoulder Capsulitis, where there was a slight decrease from a score which was already high. In fact Table 44 shows that the proportion of correct diagnoses for this disorder dropped from 80% to 75% when the AID was used.

5.4 DISCUSSION AND CONCLUSIONS

Altogether 8 GPs and 4 OPs took part as experimental subjects in the evaluation trials. This involved using their respective AIDs to consult with and diagnose 10 Standardised Patients. A further 7 GPs and 3 OPs were used as control subjects and consulted each Standardised Patient without using the AID.

A comparison between the diagnoses produced by the experimental subjects and the control subjects showed the following;

a) The doctors who used the AID made considerably more correct diagnoses (85.0%) than those who worked without it (54.5%).
b) The doctors who used the AID made considerably fewer wrong diagnoses (11.7%) than those who worked without it (28.3%).
c) The association between using the AID and obtaining a correct diagnosis was highly significant (p=0.00000).
d) These trends were repeated separately for GPs and OPs.

Doctors who used the AID indicated that they felt it was effective: All doctors felt it led them to a more informed diagnostic decision, and three quarters felt that it helped them reach a more accurate diagnosis. In addition, doctors confirmed the AID's usability since no doctor found the AID difficult to use and three quarters felt that the time taken to use it was acceptable.

Although the small study group sizes limit the generality of the findings, the trends observed in the earlier stages of the project were supported by this study. These trends were consistent in that they provided evidence that the AID was perceived as helpful as well providing as statistically significant data supporting its usefulness generally.

It can be concluded that the AID seems to be helpful to both GPs and OPs in improving diagnostic accuracy. In addition, both GPs and OPs it made many fewer incorrect diagnoses. The finalised version of the AID for OPs is shown in Appendix 5. This is identical to that for the GPs except it contains additional parts to help the OP with further diagnosis.

The results on improved levels of diagnosis are consistent with theoretical expectations which suggest that providing support for human memory, attention and training can be beneficial (see, for example, Wickens, 1992).

6. DISCUSSION

6.1 GENERAL

Before any experimental studies could be undertaken, a methodology for using Standardised Patients had to be developed. As this was crucial to the design of the experimental evaluation of the AID, it was felt to be important to ensure that this was undertaken in a systematic way.

The results from the study to develop this methodology showed that a paper-based self-training package could be used to train Standardised Patients to take part in simulated consultations where the doctors knew they were dealing with actors. Each actor was able to learn two cases and was able to rehearse each case at least three times from memory. The Standardised Patients training package enabled direct teaching to be minimised and demonstrated that it was able to provide the basis for a successful methodology.

At the start of the project, a prototype GP AID was available. There was a need, however, to develop supplementary information to help OPs to undertake a more comprehensive diagnosis. This was undertaken by a literature review to identify the needs and requirements of occupational physicians in relation to the diagnosis of upper limb disorders. From this it was concluded that there was very little in the literature covering the experience of OPs diagnosis of ULDs and any subsequent needs or requirements. The available evidence suggested that OPs would find a AID of considerable use and that anecdotal evidence needed to be sought regarding OPs perceptions of the usability to complement evidence from the scientific literature.

The approach taken, therefore, was to obtain further views of OPs and use expert opinion. The outcome of this was the development of supplementary information, designed to aid the OP obtain a more detailed diagnosis (see parts D and E, of Appendix 5).

In addition there was a requirement to update the diagnostic criteria and to extend the conditions to include the shoulder and neck. The advantage of the latter was to be able to cover a representative sample of common disorders from different areas of the upper limb within the AID. This was undertaken by using the diagnostic criteria developed by Sinclair et al. (1997), and comparing this with the surveillance criteria identified by Harrington et al. (1998). The criteria were compared to identify any differences and several changes were made to bring these in line with the surveillance criteria.

The first experimental stage involved a study of the respective AID using 10 OPs and 11 GPs under simulated consultations. The OP study was undertaken first because of logistic reasons. This study confirmed that the AID was significantly effective in increasing the number of correct diagnoses made by the OPs. The majority of OPs felt they had benefited in some way from using a standardised approach to the diagnosis of ULDs. Further, it showed that use of the AID significantly improved the average diagnosis rating for the two diffuse syndromes, as well as rotator cuff tendonitis, suggesting that the AID provided a useful

support for diagnosing these particular syndromes.

The results from verbal protocol analysis and the questionnaires raised a number of issues in relation to how the design of the AID could be changed to improve it's usability. These included; making Part A an optional part for OPs and altering the order in which the syndromes were listed in parts B and C. The verbal protocol analysis results also provided the basis for suggested changes to the OP training package to increase OPs' awareness of how to use the AID effectively. These included emphasising that diffuse pain was far more common than precise pain and that parts B and C should only be used after taking a full patient history.

The GPs study confirmed that the AID was significantly effective in increasing the number of correct diagnoses. In addition it was shown that use of the AID significantly improved the average diagnosis rating for the two diffuse syndromes, as well as arthritis and frozen shoulder. The latter suggested that the AID provided a useful support for diagnosing these syndromes. The majority of GPs felt the AID had helped them diagnose the more uncertain or less obvious syndromes.

The results from verbal protocol analysis and the questionnaires raised a number of issues in relation to how the design of the AID could be changed to improve it's usability. This mainly involved adding information to the AID to help differentiate between syndromes which were often confused in the trials. Results from the verbal protocol analysis also suggested changes to the GP training package to increase GPs' awareness of how to use the AID effectively.

In conclusion, the overall results from the study provided early indications that both versions of the AID were improving diagnosis. Both OPs and GPs reached a more accurate diagnosis using the AID, demonstrated by statistically significant increases in the percentage of correct diagnoses. This was at the expense of incorrect and undecided diagnoses.

In addition, it was shown that both samples of doctors had greater difficulty diagnosing certain types of disorders, particularly non-specific syndromes. This implied that there was greater need to provide diagnostic support for these types of conditions. These findings were used to help in prioritising changes to the AID, in order to target support for diagnosis where it was most needed.

The second stage of the project involved assessing the utility of the modified versions of the AID by asking doctors to apply it during normal consultations. Sixty eight OPs and 123 GPs were sent copies of the AID to use in their practices for an eight week period. Thirty three OPs and 33 GPs used it in their practices during an eight-week period.

The participants completed evaluation forms each time the AID was used and filled in a questionnaire at the end of their field trial period. The results from the evaluation forms from both sets of doctors showed that there was a high level of agreement that the AID led to more accurate and more informed diagnoses. There was also substantial agreement that it was useful for judging work-relatedness of a condition, and had influenced the clinician's management plan.

In addition, usability issues were considered. A high level of agreement was obtained supporting the view that the AID was not difficult to use and took an acceptable amount of time to use. Recommendations for minor improvements to the AID and training package were generated.

Examining the findings in more detail, it appears that GPs found the AID to be reasonably effective. For example they felt that it increased their diagnostic accuracy on 42% of occasions and helped them to make a more informed decision in 52% of consultations. In addition, the usability of the AID was shown to be high, since GPs found no difficulty using it for three quarters of their consultations and thought the time taken to use it was acceptable for around half of cases. Other benefits were that the AID was found to be useful for judging work relatedness in 35% of cases and supported the GPs' management plan on 41% of occasions. These are all important findings in relation to the perceived usefulness and practicality of using this type of decision support in work conditions.

The percentage of positive statements about the AID in relation to each of the above issues was generally greater for shoulder and neck, than for hand and wrist problems. This is an important result when considering that specific disorders of the shoulder and neck made up 55% of the cases for which the GPs used the AID. Further, the proportion of positive responses for most of the issues examined was greater for shoulder, neck, hand and wrist conditions than for elbow disorders. A reasonable explanation of this trend is that the elbow conditions covered by the AID are relatively straightforward to diagnose, so a diagnostic AID may not provide any additional help. This is supported by the finding that, for nearly two thirds of the elbow disorders, GPs felt that a diagnostic AID could not be expected to refine their initial working diagnosis. This finding was higher than for any other type of disorder.

At a practical level, the usefulness of the AID was perceived as generally good for non-specific disorders, with the perceived accuracy and information provided for diagnosis being higher than for hand/wrist problems. This finding is especially encouraging for its potential to help GPs because non-specific problems appear to form a particular challenge.

The findings also indicated that the perceived usefulness of the AID varied according to GPs levels of experience of diagnosis. For example, GPs who saw fewer upper limb complaints perceived the AID helped them to reach a more accurate diagnosis ($p<.01$), and were more likely to perceive the AID not difficult to use ($p<.01$). Further they were more likely to perceive the time taken to use the AID as acceptable ($p<.01$) and more likely to agree that the AID was useful for judging work-relatedness ($p<.01$). This is not surprising at a theoretical level. The finding implies that the AID was helping to support those who have not benefited from regular exposure to these conditions and so have not been able to acquire and maintain knowledge and skills in this area.

A similar trend was shown by GPs with fewer years' general practice experience more likely to perceive the AID helped them make a more informed diagnostic decision ($p<.05$), and more likely to perceive the AID not difficult to use ($p<.01$). These GPs were more likely to perceive the AID helped judging work-relatedness

(p<.05) but less likely to agree that the AID supported disorder management (p<.05).

Examination of the impact of experience in occupational medicine showed that more experienced GPs perceived the AID helped them to reach a more accurate (p<.01) and more informed (p<.05) decision about diagnosis. In addition, they were more likely to perceive the time taken to use the AID was acceptable (p<.01) and that it was useful for judging work-relatedness (p<.01).

Examining the findings of the OP study in more detail, it appears that the sample found the AID to be effective. They perceived increased diagnostic accuracy for over half, and more informed decisions for over three quarters of consultations. In addition, the usability of the AID was shown to be high, since OPs found no difficulty using it for over three quarters of consultations and thought the time taken to use it was acceptable for over eighty percent of cases. Other benefits were that the AID was found to be useful for judging work relatedness in over half of cases and supported the OPs' management plan on just under half of cases.

The AID was felt generally to be more helpful for initial working diagnosis for shoulder, neck, hand and wrist than for elbow disorders. Similar to the GPs results, it is likely that the elbow conditions were relatively straightforward to diagnose, therefore the AID was not providing useful support. This perception was, however, much lower than for the GPs, with over a third of OPs feeling that the AID could not be expected to refine their initial working diagnosis for elbow disorders. So, in contrast to the GPs, the OPs appeared to find the AID of more value for elbow complaints.

In a similar vein to the GP results, the usefulness of the AID was perceived as generally good for non-specific disorders, with the perceived accuracy and information provided for diagnosis being similar to hand/wrist problems.

The analysis also indicated that the usefulness of the AID varied according to the OPs' levels of experience. The significant trends included those OPs seeing more upper limb complaints being more likely to perceive the AID helped them to reach a more accurate diagnosis (p<.05), and more likely to find the AID not difficult to use (p<.05).

OPs with more clinical experience were more likely to find the AID useful for judging work-relatedness (p<.01) and supporting disorder management (p<.01). Further, OPs with more years' occupational medicine experience were more likely to find the AID useful for judging work-relatedness (p<.01).

In both studies, the sample size of OPs and GPs was relatively small and the participants could be viewed as being self selected, and so not necessarily representative of all GPs and OPs. They were, in effect, volunteers. It can be concluded, however, that the AID was perceived to be helpful in these operational conditions. Further, the type of information obtained appeared consistent.

Recognising the time limitations imposed upon GPs, the findings appear to indicate that the objective, of keeping the aid relatively simple, practical and easy to use, had been achieved. At a practical level, if a similar result could be obtained from

the majority of consultations in the UK, this increase in diagnostic effectiveness could have a major impact on the number of conditions mis-diagnosed.

The final stage of the project was an experimental study designed to confirm whether the latest version of the AID continued to help in diagnosis of conditions. This used 7 OPs and 15 GPs recruited from the Scottish central belt and Grampian area. The sample size was obtained from around 50 OPs and 700 GPs invited to take part. Although the sample size was low and the generality of the findings limited, the results continued to be encouraging.

A comparison between the diagnoses produced by the experimental and the control doctors (for both OPs and GPs) showed the following. The doctors who used the AID made considerably more correct diagnoses (85.0%) than those without it (54.5%). The association between using the AID and obtaining a correct diagnosis was highly significant ($p=0.00000$). In addition, doctors who used the AID made under half as many wrong diagnoses (11.7%) than those who worked without the AID (28.3%).

Doctors who used the AID indicated that they felt it was effective. All these doctors felt it led them to a more informed diagnostic decision, and three quarters felt that it helped them reach a more accurate diagnosis. In addition, doctors confirmed the AID's usability, since no doctor found it difficult to use and three quarters felt that the time taken to use it was acceptable. Although the small study group sizes limit the generality of the findings, the trends observed in the earlier stages of the project were supported by this study. The previous trends provided evidence that the AID was perceived as helpful in actual consultations, as well as providing statistically significant evidence generally supporting its usefulness.

From this study, therefore, it can be concluded that the AID seems to have been helpful to both GPs and OPs in improving diagnostic accuracy with fewer incorrect diagnoses. These results are consistent with theoretical expectations which suggest that providing support for human memory, attention and training can be beneficial (see, for example, Wickens, 1992).

Overall, the AID appears to have the potential for improving diagnostic accuracy for both GPs and OPs, with fewer incorrect diagnoses. Further, it appears that the time taken to use it could be acceptable in practice.

The final version of the AID, modified to take account of all the comments, can be found in Appendix 5. The training package for Occupational Physicians is shown in Appendix 6.

6.2. GENERAL IMPLICATIONS

The stages of the project were designed to answer a number of questions associated with determining whether it was possible to improve the diagnosis of Upper Limb Disorders. It was felt that there was a need to build in experimental studies as well as obtain field based views of both GPs and OPs.

To this end, the use of Standardised Patients was a novel means of designing experimental situations to test the effectiveness of the AID. Although substantial

time and effort was invested in attempting to obtain a large sample of participants, it can be seen that the number who took part was not as high as was wanted. In addition the participants were volunteers. Both these factors limit the generality of the findings. During the field study, however, there were 285 and 264 consultations undertaken by GPs and OPs respectively. This is a reasonable number of conditions which were seen and increases confidence in the generality of the findings. It can be concluded, therefore, that using an approach based on the AID could be helpful to both GPs and OPs in improving diagnostic accuracy with fewer incorrect diagnoses.

The implication of such improved diagnostic accuracy is that there will be a need to focus on improving the management of the conditions. The latter requirement is especially relevant when considering the management of non specific conditions.

It can be seen from the design of the study that it was intended to have higher sample sizes than were achieved. This was despite the effort expended in trying to obtain participants. Clearly, studies such as this one which depended upon volunteers from working GP and OP populations face recruitment challenges. This is an issue which will need to be addressed in future studies of this type, perhaps by co-ordination at a national level.

Informal feedback from participants indicated that the AID provided a useful basis for training. This has implications for the training of both OPs and GPs. The fact that it was possible for both GPs and OPs to learn how to use it by means of a paper based training package provides a flexible means of delivery. It is clear that the AID could be developed to train medical students and used as a means to improve practitioner skills, either by didactic or self learning. The latter could be by distance learning.

Decisions now need to be made about the final form of the AID. Further, some of the design recommendations suggested in the field trials need to be reviewed as part of this process.

6.3 CONCLUSIONS

6.3.1 A paper-based self-training package could be used to train Standardised Patients to take part in simulated consultations where the doctors knew they were dealing with actors

6.3.2 The Standardised Patients training package enabled direct teaching to be minimised and demonstrated it provided the basis for a successful methodology

6.3.3 The first experimental study was helpful in the development of the AID because it showed that;

a) the AID was significantly effective by increasing the number of correct diagnoses for both OPs and GPs at the expense of incorrect and undecided diagnoses

b) the majority of OPs felt they had benefited in some way from using a standardised approach to the diagnosis of ULDs, while the majority of

GPs felt the AID had helped them diagnose the more uncertain or less obvious syndromes

c) the AID provided a useful support for both OPs and GPs, in diagnosing the two diffuse syndromes as well as rotator cuff tendonitis for OPs, and arthritis and frozen shoulder for GPs

d) the design of the AID could be changed to improve it's usability

e) both samples of doctors had greater difficulty diagnosing certain types of disorders, particularly non-specific syndromes and rheumatoid arthritis implying greater need to provide diagnostic support for these conditions

6.3.4 The second stage, where doctors applied the AID during normal consultations for an eight week period, provided information on practical issues including perceived usability, by showing;

a) both sets of doctors had an acceptable level of agreement that the AID led to more accurate and more informed diagnoses

b) there was substantial agreement that the AID was useful for judging work-relatedness of a condition, and influenced the clinician's management plan

c) a good level of agreement that the AID was not difficult to use and took an acceptable amount of time to use

d) that the AID was perceived to be helpful in operational conditions despite the relatively small sample size

6.3.5 The final experimental study showed the effectiveness of the AID for both OPs and GPs who used it, by showing that;

a) they made considerably more correct diagnoses (85.0%) than those without it (54.5%) which was highly significant (p=0.00000)

b) they made under half as many wrong diagnoses (11.7%) than those without it (28.3%)

c) they all felt the AID led them to a more informed diagnostic decision

d) three quarters of them felt that it helped them reach a more accurate diagnosis

e) the AID's usability was confirmed since no doctor found it difficult to use

f) three quarters felt that the time taken to use it was acceptable

6.3.6 Overall, the AID appears to have the potential for improving diagnostic accuracy for both GPs and OPs, with fewer incorrect diagnoses. Further, it appears that the time taken to use it could be acceptable in practice.

6.3.7 With the time limitations imposed upon GPs, the findings appear to indicate that the objective, of keeping the aid relatively simple, practical and easy to use, had been achieved.

6.3.8 If a similar result using the AID could be obtained through the majority of consultations in the UK, the increase in potential diagnostic effectiveness could have a major impact on the number of conditions mis-diagnosed.

6.3.9 With improved diagnostic accuracy there will be a need to focus on improving the management of conditions, especially those which are non specific.

6.3.10 It is clear that the AID could be developed to train medical students and used as a means to improve practitioner skills, either by didactic or self learning, including distance learning.

6.3.11 Studies such as this one which depended upon volunteers from working GP and OP populations face recruitment challenges which will need to be addressed in future studies, perhaps by co-ordination at a national level.

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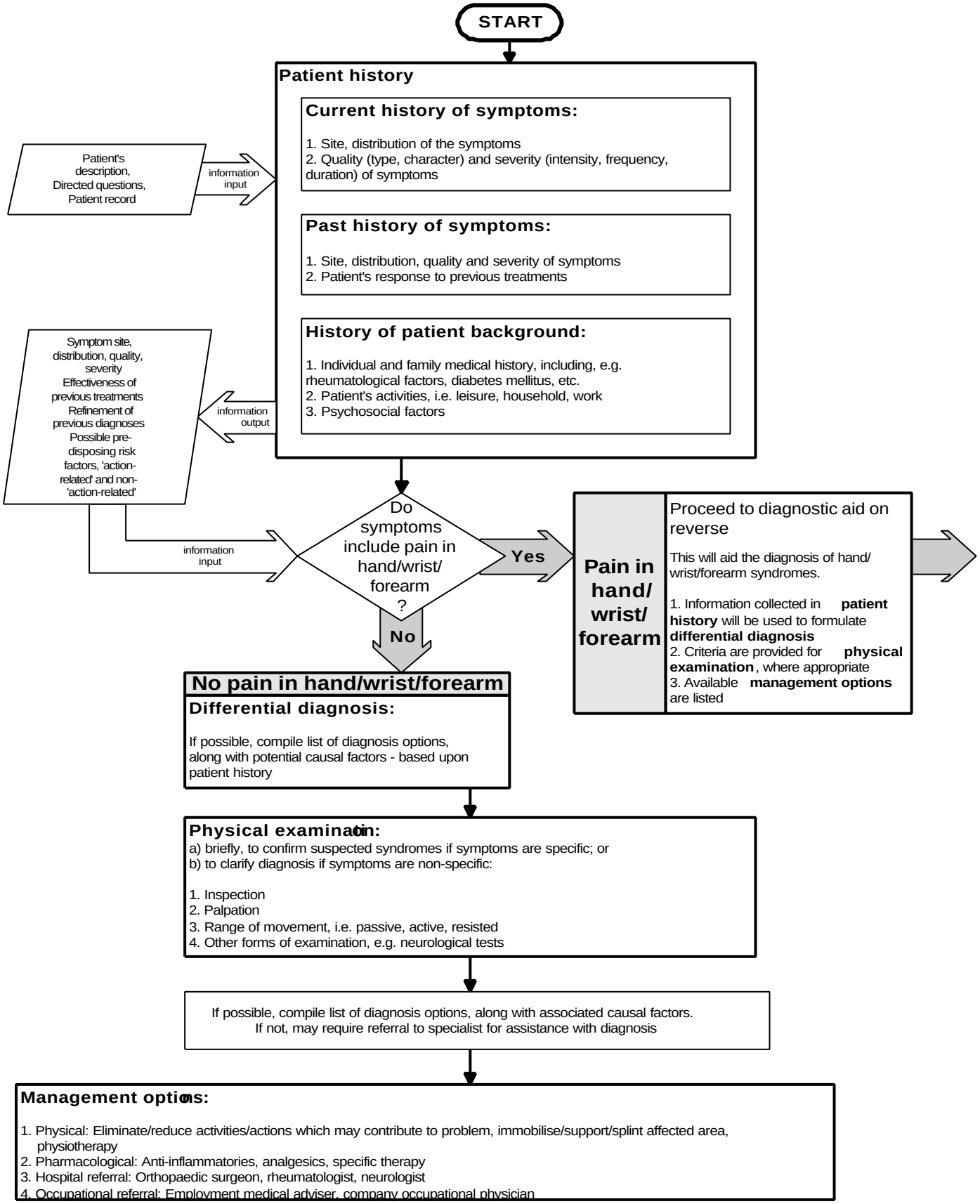
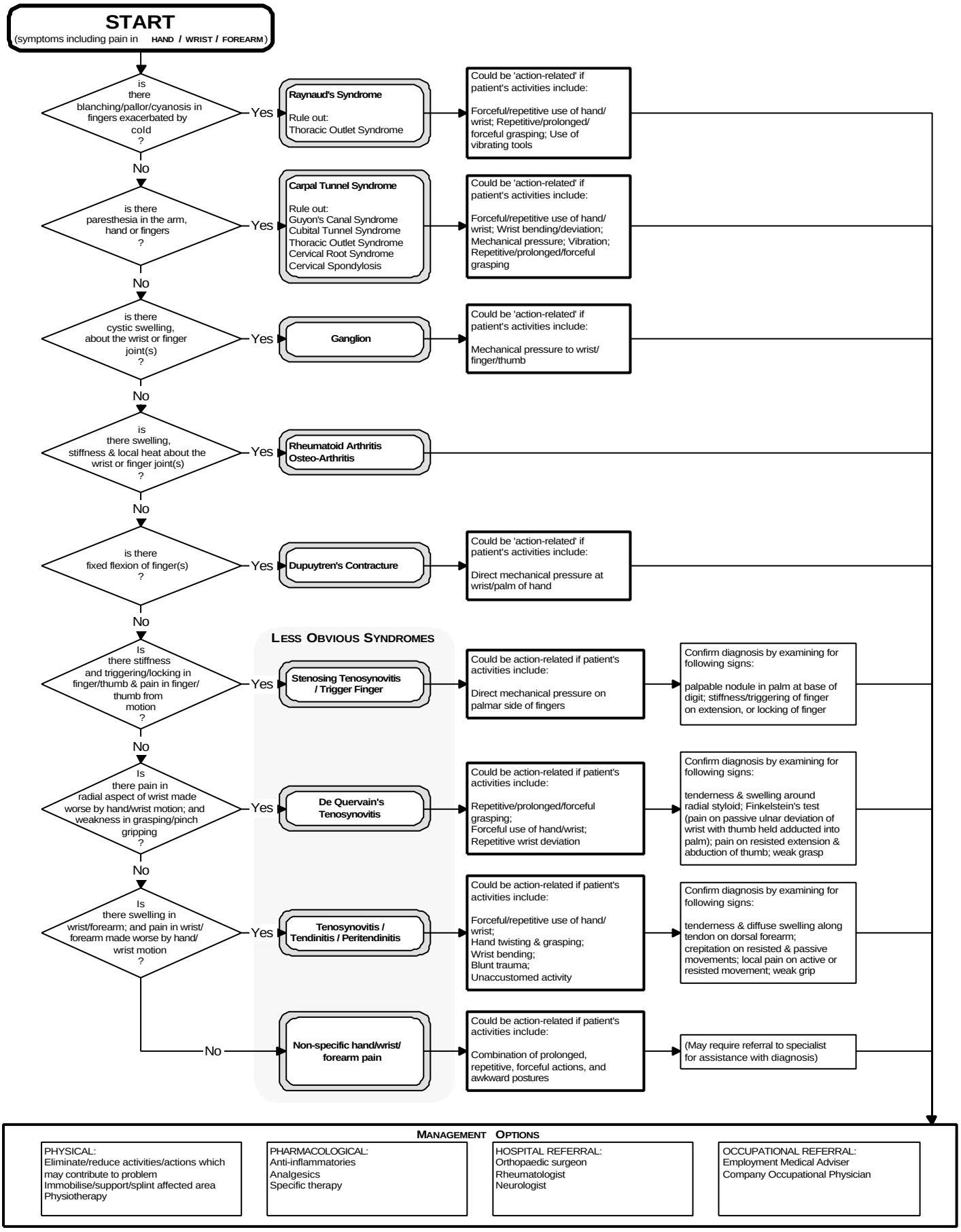
Finally our appreciation goes to those General Practitioners and Occupational Physicians throughout Scotland, England, Wales and Northern Ireland who participated in the different types of trials. Without these the project would not have been possible.

APPENDIX 1



Part A Aide memoire for medical assessment of upper limb disorders



Part B Diagnostic decision Aid for symptoms of pain in hand/wrist/forearm

Appendix 2.A
Sample pool of role-play questions

The pool of questions which follow have been set out in a similar format to the standardised case histories in Appendices 2.B and 2.C, so that these can be matched with corresponding symptoms for a role-play situation. The headings are given in the left column and corresponding questions to be asked by the role-play examiner are given on the right.

History of Symptoms		
Volunteered:	What can I do for you? How can I help you?	What seems to be the problem?
Detail:	Tell me a bit more about the pain. Where is the pain?	Show me where it hurts.
How long:	How long have you had this problem? Did the pain come on suddenly?	How long have you had this pain? Is the pain getting worse?
Radiation:	does the pain spread anywhere? does the pain go anywhere? does the pain move around?	does the pain go up/down your arm? does the pain go into your head?
Character:	What is the pain like? What kind of pain is it? Is it severe? Is it dull?	Is it a throbbing pain? Is it a sharp stabbing pain? Do you get pins and needles?
Severity:	Can you describe the pain?	Does it stop you from doing your usual activities?
Duration:	Is there pain there all the time? Does the pain come and go?	When you get the pain how long does it last?
Frequency/ Periodicity:	How often do you get the pain?	When it is there is it constant or does it vary in intensity?
Special Times of Occurrence:	Are there any special times of occurrence? Is it related to anything you do? Does exercise make it worse? Does rest make it better?	Does pain wake you at night? Does pain stop you from sleeping? Is the pain worse in the morning?
Aggravation:	Does anything bring on the pain or ease it? Do any movements affect the pain? Were you doing anything in particular when the problem developed?	Does anything make it worse? Is there anything you do that makes it worse or brings on the pain?
Relief:	Does anything make it better?	Can you do anything to relieve the pain or discomfort?
Associated features:	Are there any other features? Is there anything else? Is it just pain or do you get other symptoms associated with it?	Is there stiffness? Is there tingling of fingers? Is it tender? Is your grip weak?
Other Sites:	Is there anything else that you have noticed?	Do you have pain anywhere else?

Patient Background		
Past History/Family History:	Have you had anything like this before? Is there anyone in the family with this condition?	Have you had any illnesses before? Does anyone in the family have arthritis?
Drugs/Allergies:	Are you taking any medication?	Are you allergic to anything?
Work Activity:	Do you work? What is your work? Is the pain worse at work?	What do you do at work? Are you able to work at present? How often do you repeat the same action?
House Activity:	Are you able to do normal housework?	Are you doing any DIY?
Leisure Activity:	Have you any hobbies?	Do you play any sports?

Appendix 2.B
Standardised case histories - lower arm

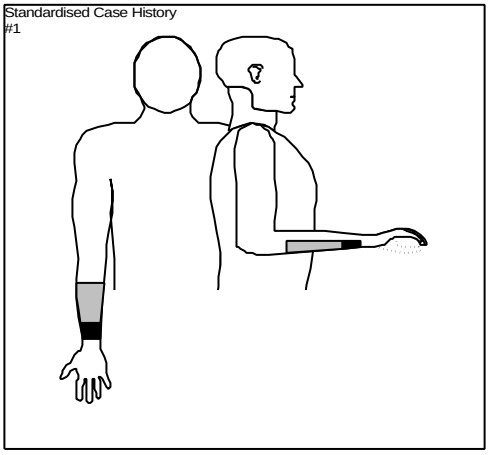
#1 Right Wrist Flexor Tenosynovitis

Actor Selection: Age: Young (20-40)
Sex: M<=F
Right handed

History of symptoms	
Volunteer:	**Pain in my wrist**
If asked generally for more detail:	**Show area shaded in black, slightly up from wrist** **It's tender and sometimes swollen** (not swollen today*) **Dull ache, severe when I grip things**
How long:	3 months, gradual onset, gradually getting worse
Radiation:	goes up my arm (halfway to elbow*) - area shaded in grey
Character & Severity:	dull ache at rest severe when I move it and grip things
Duration/ Frequency/ Periodicity:	goes away after resting for a few hours after activity - pain lasts for hours
Special Times of Occurrence & Aggravation:	when gripping and bending wrist **any movement especially bending the wrist** / (it also crackles when I bend*)
Relief:	**rest**
Associated features:	tender, sore to press (site shaded in black*) weak grip sometimes swollen/red (not today*) burning/numbness in fingertips
Other Sites:	no

Patient Background	
Past History/Family History:	nil of note
Drugs/Allergies:	nil
Work Activity:	gutting fish, Mon-Fri, 9-5, still working 100 to 200 fish per hour (involves forceful and repetitive grasping*) (involves forceful and repetitive wrist bending*)
Household Activity:	nothing extreme or unusual
Leisure Activity:	cycling (to work, and once or twice at the weekend*)

**only give bracketed answer added if asked more, e.g. "where exactly?" or "what does it involve?"*



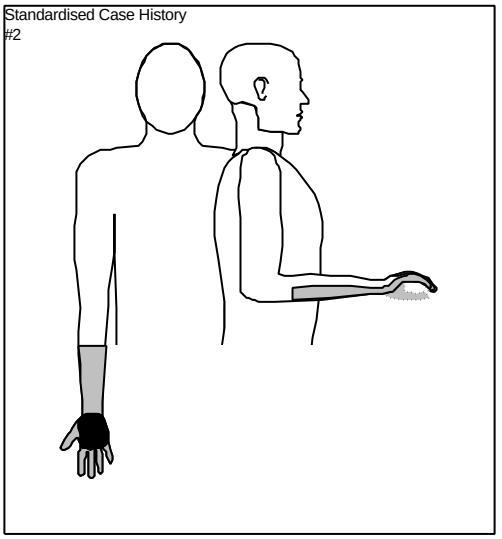
#2 Right Carpal Tunnel Syndrome

Actor Selection: Age: middle aged (40-50)
Sex: F>M
Right handed

History of symptoms	
Volunteer:	**Odd pains (discomfort*) in my right hand - area shaded in <u>black</u>**
	I drop things
If asked generally for more detail:	**Weakness of grip**
	Numbness, Tingling, burning feeling
How long:	3 months, gradual onset, gradually getting worse
Radiation:	finger tips and up forearm - area shaded in <u>grey</u>
Character & Severity:	burning sensation
	worse at night (wakes me at night*)
Duration/ Frequency/ Periodicity:	intermittent - comes and goes
Special Times of Occurrence &	worse at night
Aggravation:	made worse by flexion of wrist, grasping, gripping, wringing out
Relief:	'Flick' movement - shake hand
	warm water
Associated features:	**weak grip - drop things**
	numbness (loss of feeling*)
	Tingling, burning in fingers
Other Sites:	nil

Patient Background	
Past History/Family History:	nil of note
Drugs/Allergies:	nil
Work Activity:	gutting fish, Mon-Fri, 9-5, still working
	100 to 200 fish per hour
	(involves forceful and repetitive grasping*)
	(involves forceful and repetitive wrist bending*)
Household Activity:	nothing extreme or unusual
Leisure Activity:	cycling (to work, and once or twice at the weekend*)

**only give bracketed answer added if asked more, e.g. "where exactly?" or "what does it involve?"*



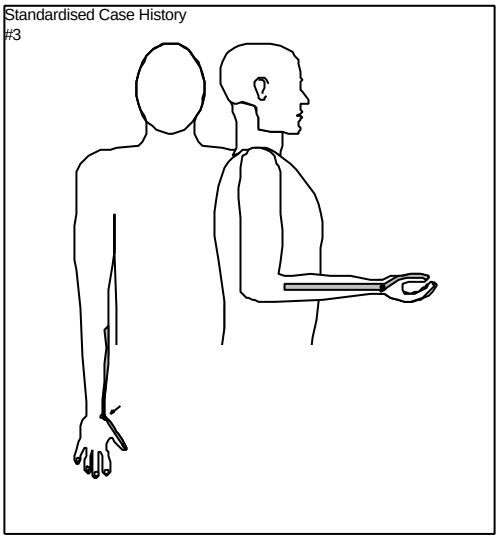
#3 Right De Quervain's disease

Actor Selection: Age: Any (since rare)
Sex: Any
Right handed

History of symptoms	
Volunteer:	**Pain in right wrist**
If asked generally for more detail:	**Show anatomical snuff box**, where base of thumb joins wrist - area shaded in <u>black</u>** **It hurts when I press here - area shaded in <u>black</u>** **It's tender and sometimes swollen** (not swollen today*)
How long:	3 months, gradual onset, gradually getting worse
Radiation:	Thumb and aspect of forearm on same side as thumb - area shaded in <u>grey</u>
Character & Severity:	dull ache **worse with movement**
Duration/ Frequency/ Periodicity:	lasts a few hours after using hand then becomes a dull ache
Special Times of Occurrence & Aggravation:	when moving wrist/thumb (do not be too specific)
Relief:	rest
Associated features:	(weak pinch grip - i.e. gripping between thumb and fingertips*) **tender and sometimes swollen**
Other Sites:	no

Patient Background	
Past History/Family History:	nil of note
Drugs/Allergies:	nil
Work Activity:	gutting fish, Mon-Fri, 9-5, still working 100 to 200 fish per hour (involves forceful and repetitive grasping*) (involves forceful and repetitive wrist bending*)
Household Activity:	nothing extreme or unusual
Leisure Activity:	cycling (to work, and once or twice at the weekend*)

**only give bracketed answer added if asked more, e.g. "where exactly?" or "what does it involve?"*
***bring your thumb away from your palm. The anatomical snuff box is the hollow on the outside of the thumb at its base.*



#7 Right non-specific diffuse forearm pain

Actor Selection:

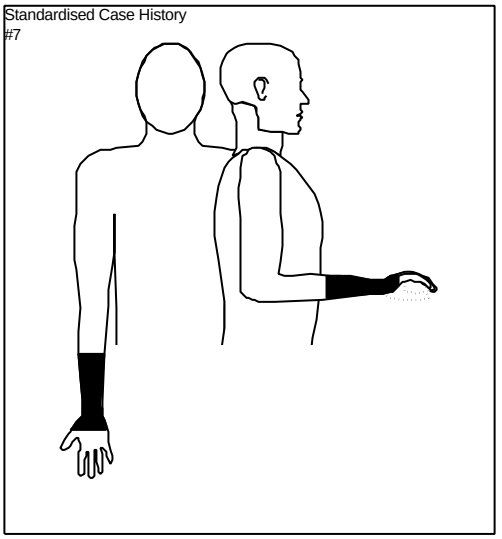
Age: Young
Sex: F>M
Right handed

(Note: Patient should be more talkative, actor should have free role to improvise to some extent, answers yes to almost everything, tends to contradict oneself.)

History of symptoms	
Volunteer:	**Pain in my arm/wrist (point generally to lower forearm)**
If asked generally for more detail:	**Show area shaded in <u>black</u> - both sides of forearm** **weakness of hand/grip**
How long:	3 months, gradual onset, gradually getting worse
Radiation:	into hand - area of hand shaded in <u>black</u> - not into fingers
Character & Severity:	sharp pain sometimes, aches sometimes yes, severe
Duration/ Frequency/ Periodicity:	**worse in week / less in weekend**
Special Times of Occurrence & Aggravation:	none specific but general movements worsen symptoms
Relief:	none
Associated features:	tiredness, fatigue, malaise burning sensation in hand/fingers sometimes swollen (not today*)
Other Sites:	nil

Patient Background	
Past History/Family History:	nil of note
Drugs/Allergies:	nil
Work Activity:	gutting fish, Mon-Fri, 9-5, still working 100 to 200 fish per hour (involves forceful and repetitive grasping*) (involves forceful and repetitive wrist bending*)
Household Activity:	nothing extreme or unusual
Leisure Activity:	cycling (to work, and once or twice at the weekend*)

**only give bracketed answer added if asked more, e.g. "where exactly?" or "what does it involve?"*



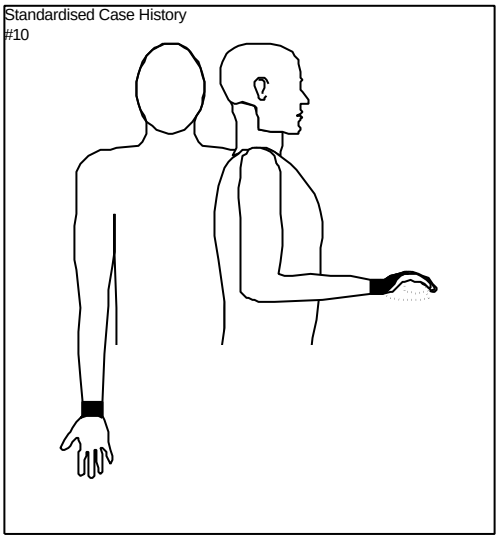
#10 Right wrist Rheumatoid Arthritis (monoarticular presentation)

Actor Selection: Age: Any, Younger>Older
Sex: F>M
Right handed

History of symptoms	
Volunteer:	**Pain and stiffness in my right wrist** - area shaded in black
If asked generally for more detail:	**Tender (sore to press) and sometimes swollen** (not swollen today*)
	Weak grip, I tend to drop things
How long:	3 months, gradual onset, gradually getting worse
Radiation:	none
Character & Severity:	throbbing pain
	awful when present but eases off
Duration/ Frequency/ Periodicity:	may last a few days but then eases off
	period varies (from day to day or week to week) but worse in morning
Special Times of Occurrence & Aggravation:	**worse in morning**
	when pain is severe, any wrist movement hurts
Relief:	none really
Associated features:	**stiffness in wrist**
	local heat
	tender (sore to press)
	sometimes swollen (not today*)
	weak grip
Other Sites:	no specific joints
	but other sites generally stiff especially in morning

Patient Background	
Past History/Family History:	nil of note
Drugs/Allergies:	nil
Work Activity:	gutting fish, Mon-Fri, 9-5, still working
	100 to 200 fish per hour
	(involves forceful and repetitive grasping*)
	(involves forceful and repetitive wrist bending*)
Household Activity:	nothing extreme or unusual
Leisure Activity:	cycling (to work, and once or twice at the weekend*)

**only give bracketed answer added if asked more, e.g. "where exactly?" or "what does it involve?"*



Appendix 2.C
Standardised case histories - upper arm

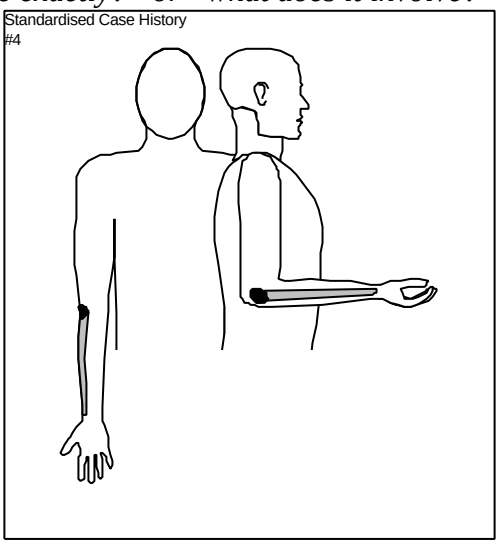
#4 Right Lateral Epicondylitis

Actor Selection: Age: Any
Sex: Any
Right handed

History of symptoms	
Volunteer:	**Pain around my right elbow on the outside - area shaded in <u>black</u>**
If asked generally for more detail:	**It's tender (show area of bone tip on outside of elbow)** **It stops me gripping things tightly**
How long:	3 months, gradual onset, gradually getting worse
Radiation:	down to wrist - area shaded in <u>grey</u>
Character & Severity:	dull nagging in the background **exquisite when I twist & grip things** (e.g. screwdriver)
Duration/ Frequency/ Periodicity:	always there but varies in intensity there most of the time but worse after gripping
Special Times of Occurrence & Aggravation:	**when gripping** (and twisting forearm*)
Relief:	rest (relieves slightly)
Associated features:	twisting forearm gives pain weak grip **tender to touch**
Other Sites:	no

Patient Background	
Past History/Family History:	nil of note
Drugs/Allergies:	nil
Work Activity:	gutting fish, Mon-Fri, 9-5, still working 100 to 200 fish per hour (involves forceful and repetitive grasping*) (involves forceful and repetitive wrist bending*)
Household Activity:	nothing extreme or unusual
Leisure Activity:	cycling (to work, and once or twice at the weekend*)

**only give bracketed answer added if asked more, e.g. "where exactly?" or "what does it involve?"*



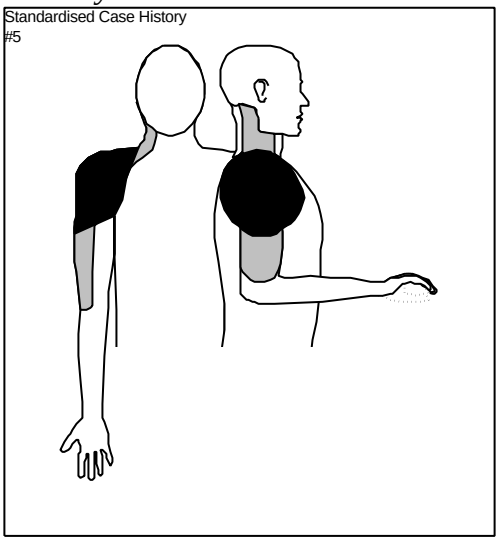
#5 Right Frozen shoulder

Actor Selection: Age: usually older (50+)
Sex: M>=F
Right handed

History of symptoms	
Volunteer:	**Pain in my shoulder and very stiff**
If asked generally for more detail:	**worse on outside** (area shaded in black*) **stiffness, hurts when I move it**
How long:	3 months, gradual onset, gradually getting worse
Radiation:	down arm to elbow, up to neck - area shaded in grey
Character & Severity:	dull ache **severe when I move shoulder**
Duration/ Frequency/ Periodicity:	**all the time**
Special Times of Occurrence & Aggravation:	**night** movement of shoulder
Relief:	rest
Associated features:	stiffness **global restriction of movement** (especially outward rotation of upper arm*) no tenderness - doesn't hurt to press
Other Sites:	no

Patient Background	
Past History/Family History:	nil of note
Drugs/Allergies:	nil
Work Activity:	gutting fish, Mon-Fri, 9-5, still working 100 to 200 fish per hour (involves forceful and repetitive grasping*) (involves forceful and repetitive wrist bending*)
Household Activity:	nothing extreme or unusual
Leisure Activity:	cycling (to work, and once or twice at the weekend*)

**only give bracketed answer added if asked more, e.g. "where exactly?" or "what does it involve?"*



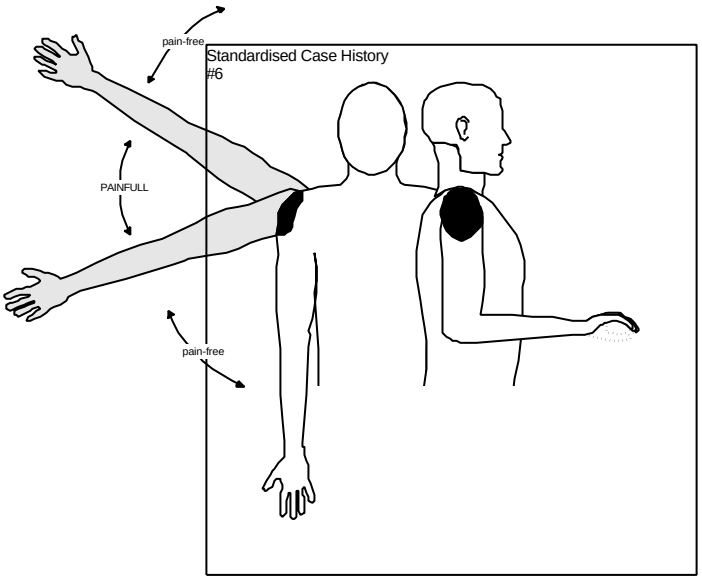
#6 Right Rotator Cuff (Supraspinatus) Tendonitis

Actor Selection: Age: Any
Sex: Any
Right handed

History of symptoms	
Volunteer:	**Pain in my right shoulder**
If asked generally for more detail:	**hurts when I lift up my arm, away from side - notably in midrange of movement** (see pictorial) **dull ache** (point to area shaded in black, if asked*)
How long:	3 months, gradual onset, gradually getting worse
Radiation:	nil
Character & Severity:	dull ache severe on elevation
Duration/ Frequency/ Periodicity:	present all the time, in the background
Special Times of Occurrence & Aggravation:	movement of upper arm, especially elevation
Relief:	rest
Associated features:	**not stiff**
Other Sites:	no

Patient Background	
Past History/Family History:	nil of note
Drugs/Allergies:	nil
Work Activity:	gutting fish, Mon-Fri, 9-5, still working 100 to 200 fish per hour (involves forceful and repetitive grasping*) (involves forceful and repetitive wrist bending*)
Household Activity:	nothing extreme or unusual
Leisure Activity:	cycling (to work, and once or twice at the weekend*)

**only give bracketed answer added if asked more, e.g. "where exactly?" or "what does it involve?"*



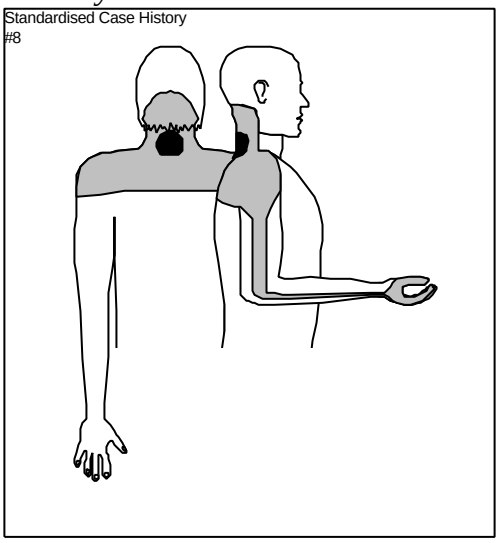
#8 Cervical Spondylosis

Actor Selection: Age: over 40s
Sex: F>M
Right handed

History of symptoms	
Volunteer:	**pain in my neck**
If asked generally for more detail:	**across the back of neck - area shaded in <u>black</u>** **feels stiff, goes into shoulder** (back of shoulder*)
How long:	3 months, gradual onset, gradually getting worse
Radiation:	both shoulders and down right arm, up to bony notch on back of head - area shaded in <u>grey</u>
Character & Severity:	ache, becoming severe at times
Duration/ Frequency/ Periodicity:	can last a few days or few hours then ease off
Special Times of Occurrence & Aggravation:	**extreme neck movement** (e.g. looking over shoulder in car at road junction)
Relief:	heat (e.g. hot water bottle)
Associated features:	**stiffness in neck** numbness/tingling in fingers
Other Sites:	headaches (around notch at back of head*) low back pain

Patient Background	
Past History/Family History:	nil of note
Drugs/Allergies:	nil
Work Activity:	gutting fish, Mon-Fri, 9-5, still working 100 to 200 fish per hour (involves forceful and repetitive grasping*) (involves forceful and repetitive wrist bending*)
Household Activity:	nothing extreme or unusual
Leisure Activity:	cycling (to work, and once or twice at the weekend*)

**only give bracketed answer added if asked more, e.g. "where exactly?" or "what does it involve?"*



#9 Diffuse neck/shoulder pain

Actor Selection:

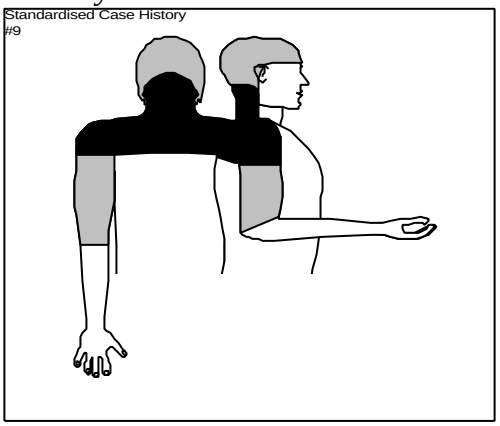
Age: Younger (20-40)
Sex: F>M
Right handed

(Note: Patient should be more talkative, actor should have free role to improvise to some extent, answers yes to almost everything, tends to contradict oneself.)

History of symptoms	
Volunteer:	**Pain in my neck and shoulders** - area shaded in black
If asked generally for more detail:	**My shoulders feel weak**
	I feel tired generally
How long:	3 months, gradual onset, gradually getting worse
Radiation:	into head (around the top of head*)
	(into arms*) - see area shaded in grey
	(No radiation into hands*)
Character & Severity:	tightness around shoulder
	yes, severe
Duration/ Frequency/ Periodicity:	**constant**
Special Times of Occurrence & Aggravation:	any exercise/movement
Relief:	nil
Associated features:	**tiredness/ no energy/ fatigue**
	headache (generalised)
	numbness (non-specific - arms)
Other Sites:	Tender spots, aches and pains at various sites in back, shoulder blades, top of legs, top of hips

Patient Background	
Past History/Family History:	nil of note
Drugs/Allergies:	nil
Work Activity:	gutting fish, Mon-Fri, 9-5, still working
	100 to 200 fish per hour
	(involves forceful and repetitive grasping*)
	(involves forceful and repetitive wrist bending*)
Household Activity:	nothing extreme or unusual
Leisure Activity:	cycling (to work, and once or twice at the weekend*)

**only give bracketed answer added if asked more, e.g. "where exactly?" or "what does it involve?"*



Appendix 2.D
Proforma to assess surrogate patient performance in standardised case history presentation

Assessor's Name _____
Actor's Name _____ History (# & Name)
_____

Please read through and familiarise yourself with the following questions before use of this assessment sheet. Then complete the following checklist by circling either 'yes' or 'no'. Make comments where appropriate, particularly where answers in italics have been circled.

Knowledge of case

1. Did patient present **all** of the *essential symptom details* (see case histories attached*)? **YES** *NO*

2. Did patient present **at least half** of the *non-essential symptom details*? **YES** *NO*

3. Did patient respond with **'don't know'** to questions about *unknown details*? **YES** *NO*

Competence of presentation

1. Did patient present any *unlisted symptom details*? *YES* **NO**

2. Could any *unintentional verbal hesitation*** be detected during the presentation? *YES* **NO**

3. Was *eye contact* kept **minimal**, to enhance realism of the presentation? **YES** *NO*

4. Did the patient's *body language* appear to be more **uptight** than confident, to enhance realism? **YES** *NO*

5. Did the patient appear to be particularly **assertive** during the consultation? *YES* **NO**

* *Case histories are shown in Appendics B and C and were attached to this sheet, in checklist form, for evaluating actors.*

** *Unintentional verbal hesitation refers to hesitation which is not part of the role play, but is due to difficulty recalling symptom details.*

Appendix 2.E
Unused draft of post-consultation questionnaire

Your Name _____ **Doctor's Name** _____

Can you please complete the following questionnaire by circling either 'yes' or 'no', providing reasons for your answers and additional comments where you feel appropriate

1. Did the physician seem to have any difficulties using the aid? YES NO
Give reasons for your answer and any additional comments if appropriate

_____

_____

2. Did the physician appear to be confused or incoherent while using the aid? YES NO
Give reasons for your answer and any additional comments if appropriate

_____

_____

3. Did the physician show any signs of being uncomfortable with using the aid as part of the consultation? YES NO
Give reasons for your answer and any additional comments if appropriate

_____

_____

4. Did the physician seem to be irritable or impatient while using the aid? YES NO
Give reasons for your answer and any additional comments if appropriate

_____

_____

Appendix 2.F
Surrogate Patient Training Introduction

++READ THIS DOCUMENT FIRST++

University of Aberdeen
Department of Environmental and Occupational Medicine
Development and Evaluation of Diagnostic Support Aids for Upper Limb Disorders

1. SURROGATE PATIENT TRAINING INTRODUCTION

Contents

Foreword

This document is designed as a training package, to be used for teaching purposes only. It contains an illustration of a flowchart aid for the diagnosis of upper limb complaints. This flowchart is a draft version in extract form and as such should not be considered as comprehensive. In addition, the flowchart should not be used for purposes of self-diagnosis.

1. Overview of training

The following text will introduce you to the issues which are of interest to the researchers of this study and briefly explain what is involved for you, the actor.

First of all, the research interests will be briefly explained with a view to giving you an appreciation of what the researchers wish to investigate and how they intend to do this. Next, you will be given an overview of the consultation procedure and how the diagnostic aid will be included in this. This will give you a taste of the types of questions you will need to answer when playing the role of the surrogate patient.

Along with this document, you should have been provided with a document entitled "Surrogate Patient Training Package." This will provide comprehensive instructions of your role as a participant in the study. This contains the following materials:

- Main body of document, giving training instructions (5 pages)
- A set of consultation role-play questions (Appendix A)
- 2 different 'Standardised Case Histories' (Appendices B and C, each 2 pages)

If any of these materials has been omitted, please contact the researchers immediately at the telephone number given in Section 4, at the end of this text. The researchers are also available to answer any queries about the package, or the study in general.

---

2. The research

2.1 Background

Due to the far reaching consequences for patients diagnosed as having so-called "Repetitive Strain Injury" or Upper Limb Disorders (ULDs), the Health and Safety Executive (HSE) wish to assist General Practitioners (GPs) and Occupational Physicians (OPs) by producing a support aid to guide diagnosis of ULDs in General Practice and in Occupational Medicine. Prototype support aids covering key points in the diagnosis and management of ULDs have already been generated by our research group for GPs and OPs respectively. This research study is intended to evaluate the aids in terms of their usability and effectiveness. It will require the assistance of a number of actors for up to around eight evenings' paid work.

2.2 Approach

The first aim of the study is to assess the usability and effectiveness of the aids in their present form, in order to identify and implement necessary changes. Pilot studies of the GP aids and OP aids will be undertaken under experimental conditions, among samples of 10 GPs and 10 OPs respectively. This will involve using a sample of 20 actors who will each be trained to present symptom histories of 2 different upper limb disorders. Ten of these actors will then be selected to present one history during 5 to 8 minute consultations with 10 GPs under simulated medical assessment conditions. Similarly, ten actors will present one history during 10 minute consultations with 10 OPs.

The next aim of the study is to evaluate the effectiveness of the aids in fulfilling their purpose. For each set of aids, this will involve a control group of 15 medical examiners undertaking consultations with each of 10 Surrogate Patients **without** the use of the aids. Another 15 medical examiners will form an experimental group which will undertake consultations with each of the Surrogate Patients , **with** the support of the aids. The findings of each group will be compared to provide a measure of the effectiveness of the aids. *For*

this part of the study, ten actors will be selected from the trained sample to present one history during 5 to 8 minute consultations with around 30 GPs under simulated medical assessment conditions. Similarly, ten actors will present one history of symptoms during 10 minute consultations with up to 30 OPs.

---

3. The consultation procedure

The procedure used by a doctor when consulting a patient is described below, along with the role that the diagnostic aid is intended to play. It is not necessary for you to learn this description, but please read it to familiarise yourself with it. This is merely intended to give you a flavour of the environment in which you will play your part as a patient.

3.1 The doctors' approach

There are generally four main parts to the consultation which will lead the doctor from the patient's initial complaint to producing a diagnosis and options for managing the problem (see Figure 1). These are:

- taking a history of the patient's symptoms
- finding out about the patient's background
- undertaking a physical examination, and
- bringing all the information together to form a diagnosis

The first part, taking a history of symptoms, will start when the patient walks into the consultation room and states what is wrong. The doctor will then ask some questions about the finer detail of the complaint, such as "how long have you had this pain?" or "what makes it worse?" This will continue until the doctor is able to obtain a reasonably clear picture of the problem.

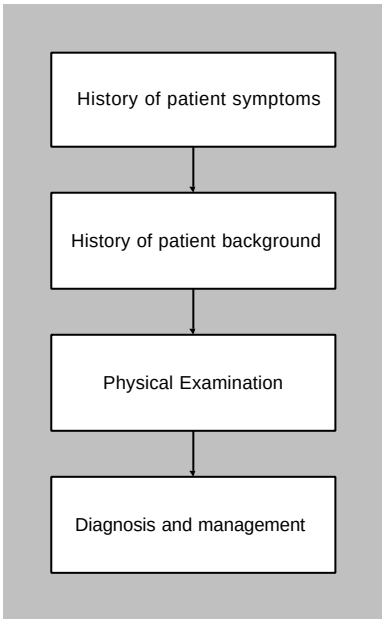


Figure 1 Overview of consultation procedure

Next, the doctor will ask questions about the patient's background in order to establish possible causes of the symptoms. This could include questions about the patient's family and own medical history, as well as questions about work and leisure activities.

At this stage, the doctor will normally have a fair idea of what diagnosis will be made. Now a physical examination will be undertaken, either to confirm the doctor's initial suspicions, or to collect additional information which will aid the diagnosis. The physical examination will usually include inspection, palpation (feeling for swelling or tenderness), and testing the range of movement of the affected joint.

Finally, the doctor will reach a conclusion about the diagnosis. This will consist of a name for the disorder (or description of symptoms), possible causes, and treatment options for preventing deterioration or stemming the problem.

3.2 The diagnostic aid

The diagnostic aid has been produced as a memory aid to support the above approach, by helping with the doctors' decision making. It is intended to augment the knowledge and experience already available to the doctors, and help to ensure that they use all the information systematically to come to a precise diagnosis. An extract from the diagnostic aid is shown in Figure 2. Do not feel obliged to learn any of the material on the aid. We have only provided it so that we can give an example of its use, as you will see shortly.

In using the diagnostic aid it is expected that doctors should take a history of symptoms and examine patient background, as normal. At this stage the aid comes into play by helping them to decide what the correct diagnosis is likely to be, based upon the information collected.

To illustrate this, look at Figure 2. The diamond-shaped boxes on the left hand side of the page give a sequence of questions to be asked. These questions will guide the doctor to an initial diagnosis, given in the second column. For example, if the history of symptoms taken by the doctor includes *stiffness and locking of a finger*, and *pain from movement of that finger*, then the questions down the left hand side of the page will lead to an initial diagnosis of "**Stenosing Tenosynovitis / Trigger Finger**".

Once this initial diagnosis has been reached, the diagnostic aid prompts the doctor to look at whether particular actions occur in the patient's day to day activities. This is to establish whether the symptoms could have been caused or contributed to by actions, e.g. in work, home or leisure activities. For the above example of **Trigger Finger**, the doctor would be prompted to examine whether the patient's activities include "**Direct mechanical pressure on the palmar side of the fingers**". If, for example, the patient's work involves the patient operating a set of pliers for long periods, by applying pressure with the affected finger, then the doctor may conclude that the patient's work could be involved in the causation of the problem. In addition, the doctor will be expected to examine other possible causes as normal, such as the patient's own and family medical history.

The aid then directs the doctor to undertake a physical examination in order to confirm the suspected diagnosis. (This stage is missed out for some diagnoses, for which a physical examination is not necessary.) In the case of our example, the doctor would be prompted to examine for a "**Palpable nodule in palm at base of digit**" and for "**Stiffness/triggering of finger on extension, or locking of finger**".

Finally, having carried out these procedures, the doctor will explain to the patient the diagnosis (i.e. the name or description of the problem, the possible causes, and how the problem will be dealt with). The flowchart provides a prompt for this stage to remind the doctor what options could be considered to treat or manage the problem.

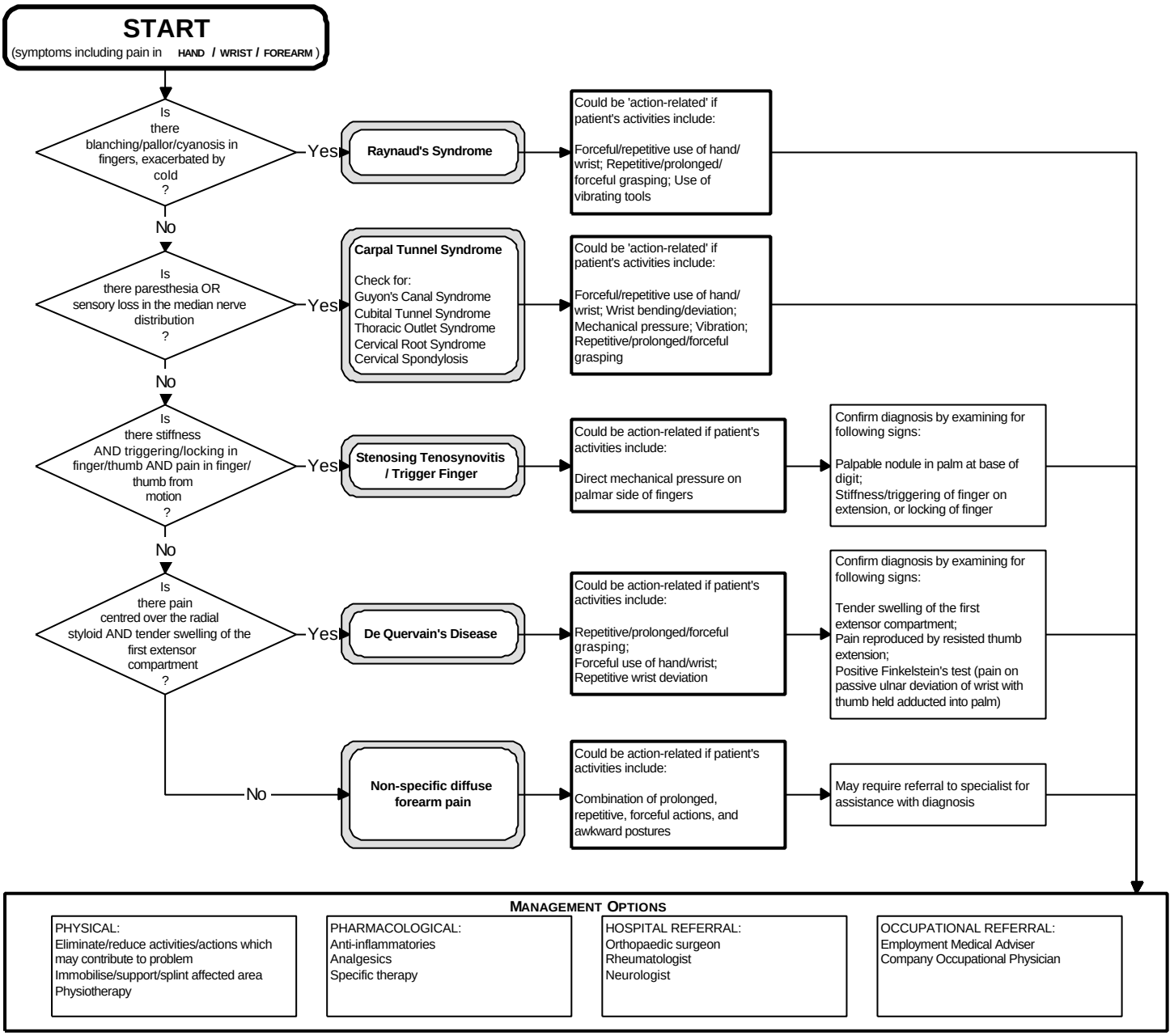


Figure 2 Extract from diagnostic aid

3.3 Questions to expect

As a surrogate patient it is in your interest to have an idea of the type of questions which a doctor is likely to ask in a consultation, so that you can anticipate how to answer them. Essentially, most of these questions will be asked when the doctor is taking a history of symptoms and examining the patient background. A pool of example questions is given in Appendix A of the Surrogate Patient Training Package. Please note that you will not be expected to learn these questions. They are only provided so that you can practise answering them once you have learned the symptoms to present. Briefly familiarise yourself with them now, as this will make it easier to place the symptoms in context when you are learning them.

The learning of symptoms and practising of their presentation is dealt with in the Surrogate Patient Training Package.

4. Technical support

Should there be any difficulties using the materials, or questions about the study and its arrangements, the researchers will be happy to assist.
They can be contacted at the venue below, Mondays to Fridays, between 9am and 5pm.

Douglas Sinclair / David Jamieson

Department of Environmental & Occupational Medicine
University Medical School
Foresterhill
Aberdeen
AB25 2ZD

Tel: 01224 681818 ext.52521
Fax: 01224 662990

Appendix 2.G
Surrogate Patient Training Package

Patient _ <Name> Cases _ & _

University of Aberdeen
Department of Environmental and Occupational Medicine
Development and Evaluation of Diagnostic Support Aids for Upper Limb Disorders

2. SURROGATE PATIENT TRAINING PACKAGE

Contents

Foreword

This document is designed as a training package, to be used for teaching purposes only. It contains two fabricated histories of upper limb complaints, along with job descriptions. As such it is not based upon and does not relate to any actual complaint made by any real patient. In addition, the job description detailed does not have any known association with the complaints, and this document is not intended to imply such a relationship.

1. Overview of package

The following text will provide comprehensive instructions of your role as a participant in the study. These are designed to establish you, the actor, as a 'surrogate patient' for the terms of the study. You should have read the document "Surrogate Patient Training Introduction" before using this package. Your remit as a surrogate patient will be to play the role of a patient in consultation conditions by presenting a particular set of symptoms in response to questioning by the doctor.

The instructions firstly will give you guidance with learning the symptoms to be presented, and refer you to the appropriate materials. Then you will be instructed how to practise presenting these symptoms, so that you will be prepared to present them in consultation conditions.

---

2. Symptom cases

You will be expected to learn two separate symptom cases for the purposes of your participation in this study. One case involves symptoms affecting the lower arm (i.e. hand, wrist, forearm) and the other, the upper arm (elbow, shoulder, neck). These are enclosed in Appendices B and C respectively. Each case consists of the following:

- case title and actor selection criteria,
- history of symptoms,
- patient background, and
- pictorial of site of symptoms.

The case histories provided have been set out in a standardised form which includes details under various headings. The headings are given in the left column of the case history and corresponding symptoms to be described by the patient are given in the right column. The headings are defined in the following section. The specific central site of symptoms is indicated by the black shading on the pictorial given with each case. The grey shading indicates where symptoms radiate to. You will notice that the patient background is the same for both case histories. This should make it easier to learn.

Furthermore, some details of the case have been emphasised in bold typeface, as these are more critical to the correct diagnosis of the problem than others. Guidelines for priority to be given to learning these details are also provided below.

2.1 Definitions

The headings under which symptom details of the case histories are listed are given below.

History of symptoms: Those aspects of the condition which can be recounted verbally by the patient either voluntarily or in response to direct questioning from the clinician.

Volunteer: Symptom details which will be offered by the patient on entering the consultation room, possibly on hearing the question "What can I do for you?" or "How can I help you?" The response will usually be to describe pain and point to the site which is indicated in **black** on the pictorial.

If asked generally for more detail: Symptoms details which may be offered by the patient in response to a general request for more information, e.g. "Tell me a bit more about the pain."

How long: This is concerned with the overall life of the condition. This is standardised at “three months” across both test syndromes.

Radiation: This involves the distribution of symptoms around the central site which would have been established earlier in response to general questioning. For example the question “Does the pain spread anywhere?” might prompt a response such as “It goes up my arm.” The site of radiated symptoms is indicated in **grey** on the pictorial.

Character & Severity: This detail involves a description of the type of pain and its intensity. This should be described in response to questions such as “Can you describe the pain?” It may be a “dull ache,” a “burning sensation,” a “nagging background pain” or a “sharp pain,” to name a few examples.

Duration/ Frequency/ Periodicity: Questions about duration are concerned with whether the symptoms are constant or ease off periodically. Frequency and periodicity are examined to establish more information about the duration and the severity, i.e. how often symptoms come and go or whether symptoms vary in intensity.

Special Times of Occurrence: This involves asking for further details about time-variation of symptoms which may not have been identified by earlier questioning.

Aggravation: The clinician will normally want to know whether the patient can recount anything (e.g. movement) which gives rise to or exacerbates symptoms. Such artefacts are referred to as aggravating factors.

Relief: In the same way, the clinician will want to know whether there are any relieving factors which reduce or eliminate the symptoms. Questions could include “Does anything bring on the pain or ease it?” or “Do any movements affect the pain?”

Associated features: Additional symptoms not directly included in the description of the main symptoms could give a lead to determining causative factors. This may for example help to establish whether upper limb pain has a musculo-skeletal cause. Open questions would take the form “Are there any other features?” or “Is it just pain or do you get other symptoms associated with it?” This may be followed by direct questions such as “Is there stiffness?”, “Is it tender?”, etc.

Other Sites: As above, description of symptoms in sites other than given in the volunteered description could indicate whether the cause is musculoskeletal or not. The clinician would normally ask questions based upon a general review of the body’s systems.

Patient Background: The patient background is the array of details about family history, medical history, activities, etc., which may give an indication of potential causal factors in relation to the condition.

2.2 Lower arm case[2]

Case #1
In essence, this case is identified by pain on the inside of the forearm just above the wrist. The character of the pain is a dull ache, and the area feels tender to touch and swollen. Any movement of the wrist aggravates the pain, particularly bending the wrist, and the pain is only relieved by rest.

Case #2
In essence, this case is identified by odd - hard to describe - pains in the palm of the hand. It leads to weakness of grip and a tendency to drop things involuntarily. An additional symptom found in the digits of the hand is vaguely described as a numbness, tingling and burning sensation. A defining detail of this condition is that the symptoms are often worse at night.

Case #3
In essence, this case is identified by pain in the wrist, located behind and at the base of the thumb. The pain is centred around an area called the 'anatomical snuff box,' which can be found by moving your thumb away from your palm. The hollow behind and at the base of the thumb is the anatomical snuff box. The position of this hollow is particularly tender to touch and it feels swollen, although isn't visibly so. Any general movement of the wrist or thumb aggravates the pain.

Case #7
In essence, this case is identified by pain throughout the lower forearm, wrist and the base of the hand. A notable feature is the generality of the pain, in that it is difficult to locate specifically. It leads to a weakness of the hand particularly when gripping. The occurrence of the pain has a set time pattern, in that it is worse during the week, and eases somewhat at the weekend.

Case #10
In essence, this case is identified by pain through the wrist, extending to the back of the hand, and stiffness of the wrist. The wrist feels quite swollen and is tender to the touch. The condition leads to weakness of grip and a tendency to drop things involuntarily. A defining detail of this condition is that the symptoms are often worse in the morning. The severity of the pain varies periodically, but when it is at its worst, it can be aggravated by any wrist movement.

This is described in more detail in Appendix B, which contains the information you should memorise and rehearse. This is not an exact script as many of the words given are unlikely to be used in a real consultation, so we would prefer you to use your own words where appropriate.

2.3 Upper arm case[1]

Case #4
The patient presenting this symptom case will have pain around the elbow on the outside. You can locate this site by feeling for the tip of the bone on the outside of the elbow. The area is tender to the touch. Pain becomes especially severe when twisting the forearm and gripping things (for example using a screwdriver), so much so, that it prevents you from being able to grip things tightly.

[2] In Sections 2.2 and 2.3, any of the boxed cases may replace the unboxed one for training packages specific to different actors.

Case #5
The patient presenting this symptom case will explain that the shoulder is painful and very stiff. Most of the pain is located over a large area around the outside of the shoulder. The severity of the pain increases on any movement of the shoulder and it is near impossible to move the upper arm in any direction (including rotation). The pain is more or less constant but does become worse at night.

Case #6
The patient presenting this symptom case will have pain in a small area on the outside of the shoulder. Pain is aggravated by the movement of lifting the arm out to the side until it points directly upwards. The distinguishing feature of this condition is that there are three 'phases' of pain for the aforementioned movement. The first third and last third of the movement are relatively pain free. It is the midrange of the movement which increases the pain. It is also important to note that the condition does not result in any stiffness of the shoulder.

Case #8
The patient presenting this symptom case will describe pain in the neck and on request will explain that it affects the back of the neck and goes generally into the shoulder too. An associated feature of the condition is that the neck feels stiff. Pain will be aggravated by extreme movement of the neck, such as looking over the shoulder.

Case #9
The patient presenting this symptom case will have pain throughout the back of the neck and shoulders. A notable feature is the generality of the pain, in that it is difficult to locate specifically. It leads to a feeling of weakness in the shoulders. The patient describing this condition will feel generally tired and fatigued and may be prone to suffer from a constant headache.

The above text describes the essential details you will need to know. Further details which you should memorise and rehearse are added in Appendix C. As stated before, use your own words where you see fit.

---

3. Learning symptom cases

You may choose to adopt a role-play approach to learn the symptoms, or choose any technique you would normally use to memorise. The following text outlines guidelines which you should follow when learning the symptoms. The guidelines ultimately set out the standards which are expected, and by which you will be assessed, in terms of knowledge of the role and presentation of the role. The text also identifies the materials which should be used for learning and practising the surrogate patient role.

3.1 Guidelines

Knowledge
The symptom details which are given in the standardised case histories are divided into essential and non-essential details. Essential details are those which are instrumental in guiding the clinician to a diagnosis. In this way, non-essential symptoms refer to those which are more incidental in nature. Such non-essential symptoms have been included in the standardised case histories in order to provide character to the cases and make them more realistic.

For this reason, the researchers are more interested in ensuring that surrogate patients have a sound knowledge of essential symptoms. Therefore you will be expected to be able to recall these details in full. Referring to the standardised case histories in Appendices B and C, you

will see that some of the symptom details are given in **bold** typeface. These are the essential details, and as such you should place the greatest priority on learning these.

Non-essential symptoms take second priority, although a reasonable knowledge of these will also be expected. Ability to recall at least half of these details is acceptable for the purposes of the research. Of the non-essential symptoms details you may notice that some are bracketed (This might not be true for some case histories). These bracketed details are ones which you would not be expected to mention in a consultation unless the doctor asks specifically for more detail. Therefore, it will only be necessary to recall these details where the doctor presses for more information than you first give in response to a question.

Finally, when you do not know or cannot remember the answer to a question, it is important that your response does not include symptoms outwith the case history. This could mislead the doctor and force him to make decisions which we had not intended as part of our experiment. Therefore your answer should be of the form, e.g. "no," "don't know" or "I'm not aware," when the details are unknown to you.

Following training, surrogate patient knowledge will be assessed using the following criteria.

- Patient should have 100% knowledge of essential symptom details.
- Patient should have at least 50% knowledge of non-essential symptom details.
- Patient should say "don't know" when asked about unknown details.

Presentation

In the interests of making the presentation of the part of the surrogate patient as realistic as is practicable, you will be expected to behave as a real patient presenting with a medical complaint. The realism of presentation is associated as much with the exhibited levels of confidence and assertiveness as the correct recall of symptoms.

Firstly, the presentation of any unlisted symptom details must be avoided, as this will affect how believable the case is. Also, verbal hesitation may be appropriate for the presentation, but it should not occur through difficulty recalling symptoms. Again, where you do not know the appropriate response to a question, your answer should be of the form "no" or "don't know."

The confidence of a real patient is not expected to be particularly high when presenting a complaint. On this basis, you should not make a great deal of eye contact with the doctor. In addition, your body language should be that of somebody who is uptight, rather than confident. Finally, it would be preferred that your manner is not assertive during the consultation.

Following training, surrogate patient presentation will be assessed using the following criteria.

- Patient should not present any unlisted symptom details.
- Patient should not show any unintentional verbal hesitation.
- Patient should keep eye contact minimal.
- Patient's body language should be fairly uptight.
- Patient should not be particularly assertive.

3.2 Method

The materials you will use for practising symptom presentation are given in the appendices at the end of this text. The practice sessions you will carry out need to be conducted on a role-play basis, therefore you will need to obtain the assistance of a competent person who will play the role of the doctor.

Sample questions
Appendix A provides a pool of example questions which are similar to those which will be asked by the doctor during an actual consultation. Your assistant will simply need to read a selection of questions from this pool in a logical order, so that you can test and improve your ability to play the role of the patient. In order to aid the logical sequencing of your assistant's questions, they have been grouped under the headings defined in the last section.

Simply starting at the top of the page and asking one question from under each heading will normally be enough to ensure that your assistant plays the complete role of the doctor. It may be appropriate for some of the questions to be skipped, as the answer to an earlier question will sometimes be full enough so that a later question is just covering the same ground.

For example, if the response to the question about **character** "What is the pain like?" were "Dull ache, severe when I move my shoulder," then there would be no need to ask a question about **severity**.

Practice sessions
Learning the symptoms may be done by any technique you would normally use to memorise. This training package provides materials so that, if you choose, you can take a role-play approach to learning. However, once you have learned the symptom cases, we positively encourage you to use this approach to practice presenting them. This would involve rehearsing the presentation of the symptoms while somebody assists you by asking appropriate prompt questions from Appendix A.

The distinction between the process of learning and the process of improving presentation can be made as follows. When learning the cases by role playing, it will be necessary to use the case history provided (Appendix B or C) as a prompt sheet. When practising to improve presentation, you should avoid, as far as possible, referring to the prompt sheet. It is expected that you should perform at least three practice sessions without the use of a prompt sheet for each standardised case history. Three is the number of sessions which we anticipate will be needed to meet the intended standard of presentation.

Appendix 2.H
LITERATURE REVIEW TO IDENTIFY NEEDS AND REQUIREMENTS OF OCCUPATIONAL PHYSICIANS IN RELATION TO THE DIAGNOSIS OF UPPER LIMB DISORDERS

2.H.1 SEARCH STRATEGY

Table 2.H.1 illustrates the databases and search strategies which were used with the aim of identifying the relevant literature.

Table 2.H.1
Databases and search strategies used to find literature on the needs and requirements of occupational physicians in relation to the diagnosis of upper limb disorders

Databases	Search Strategy
HSELINE CISDOC MHIDAS NIOSTIC	upper limb disorders OR upper extremities disorders OR cumulative trauma disorders AND occupational physicians OR occupational doctors OR occupational health practitioners OR occupational health professionals OR occupational health personnel AND diagnose OR diagnosed OR diagnosis OR diagnoses OR diagnostic
Medline	cumulative trauma disorders (MeSH) diagnosis (MeSH) ALSO occupational physicians (with the above variations) AND upper limb disorders (with the above variations) and diagnosis (with the above variations)

Both search strategies produced only one reference (Cooper and Baker, 1996). Dr Watt expressed the opinion that there would not be many papers which contained the required information. She suggested reference to the Occupational Medicine and Occupational and Environmental Medicine periodicals. Occupational Medicine was scanned from August 1993 to November 1997 and Occupational and Environmental Medicine from July 1994 to January 1998. This search was undertaken manually and produced another two references which could be deemed relevant (Boillat and Noel, 1994; Diwaker and Stothard, 1995).

2.H.2 FINDINGS

It has been established by previous research for this project, that standardised criteria are required for the satisfactory diagnosis of upper limb disorders (ULDs) and evaluation of their work relatedness. Cooper and Baker (1996) report a lack of standardised methods of labelling, clinically evaluating, and treating such disorders. This has consequences for occupational physicians (OPs) since ULDs are amongst the most common reasons for attendance to OPs (Cooper and Baker op cit.) The authors conclude that few studies have attempted to categorise ULDs into discrete pathophysiological entities. They suggest the principal discrete diagnoses which should be considered in individuals presenting to OPs with upper limb pain are the following:

- Rotator cuff
- Capsulitis
- Bicipital tendonitis
- Acromioclavicular joint dysfunction
- Glenohumeral arthritis
- Epicondylitis

- Olecranon bursitis
- Carpal tunnel syndrome
- Tenosynovitis
- Arthritis

The current research has collated information on all of the above which would be of use to OPs according to Cooper and Bakers assessment of which upper limb disorders OPs should principally consider.

Cooper and Baker (op cit.) call for an appropriate means of classifying and treating ULDs and make suggestions regarding important aspects of clinical evaluation. They conclude by stating that if features are non-specific, i.e. outwith the 10 disorders which they identify, further investigations are unlikely to be of assistance. This seems to be a somewhat defeatist attitude since the diagnostic aid under development at the moment aims to help classify some less obvious syndromes which would presumably be of benefit to OPs.

Diwaker and Stothard (1995) conducted a study which showed considerable differences of opinion, amongst groups of medical experts, concerning the meaning, labelling, and diagnosis of tenosynovitis and repetitive strain injury (RSI). Of the 74 occupational physicians contacted, only 6 returned the questionnaire used in the study. Diwaker and Stothard (op cit.) report that similar variations of interpretation were found within all groups and so merged the data together. This means it is impossible to assess the degree to which members of any group disagreed but does indicate that the OPs had differences of interpretation. The only question which allowed the comparison of opinions between members of a group related to whether subjects believed RSI was a genuine condition or not. Four of the OPs believed it was and two did not.

Boillat and Noel (1994) talk in general terms of the need for reliable information regarding the incidence and prevalence of occupational diseases with data often being unavailable. They mention the under-reporting of Carpal Tunnel Syndrome (CTS) with late diagnosis having economic as well as medical consequences. They conclude that many doctors are probably not trained to recognise the work relatedness of a disorder implying that OPs are best placed for this type of assessment. They also mention a lack of objective diagnostic criteria which presumably would hamper the OP from doing his job properly.

2.H.3 CONCLUSIONS

The conclusion of this report is that there is very little in the literature indicating the experience of occupational physicians diagnosis of ULDs and any subsequent needs or requirements. What little evidence there is suggests that OPs would find an aid for the initial medical assessment of ULDs of considerable use. It may be necessary to collect more anecdotal evidence regarding OPs perceptions of the usability of such an aid as opposed to evidence from journal papers.

2.H.4 REFERENCES

Boillat, M.A. and Noel, B. 1994, The need for more reliable information on the incidence and prevalence of occupationally related problems. *Occupational Medicine*, **44** (3), 123-124.
Cooper, C. and Baker, P.D. 1996, Upper Limb Disorders. *Occupational Medicine*, **46** (6), 435-437.
Diwaker, H.N. and Stothard, J. 1995, What do doctors mean by tenosynovitis and repetitive strain injury? *Occupational Medicine*, **45** (2), 97-104.

Appendix 2.I
COMPARISON OF DRAFT CRITERIA FOR THE INITIAL MEDICAL ASSESSMENT OF UPPER LIMB DISORDERS WITH CASE DEFINITIONS FOR WORK-RELATED UPPER LIMB PAIN SYNDROMES

2.I.1 INTRODUCTION

As an extension to the current study, it was decided that syndromes of the elbow and upper arm should be included in a diagnostic aid to support the initial medical assessment of upper limb disorders (ULDs), as well as those of the hand, wrist, and forearm. This had the advantage of covering a representative sample of common disorders from different areas of the upper limb within the aid.

Harrington et al (1998) used a group of health care professionals, from disciplines interested in the prevention and management of ULDs, to establish case definitions and surveillance criteria for several ULDs, by consensus. As with the current research, the Harrington et al. study was supported by the Health and Safety Executive. It was suggested that inclusion of the Harrington consensus criteria in the current study could only serve to increase it's validity. It would also have the advantage of allowing comparability with future studies which incorporate the Harrington consensus criteria.

For the above reasons, it was decided by the Project Steering Group (PSG) that the ULD diagnostic criteria developed by Sinclair et al. (1997), which were to be used in the current study, should be compared to the surveillance criteria identified by Harrington et al. (op cit).

2.I.2 METHOD

The first stage of the comparison was to collate both sets of criteria in tabular form. Next, the criteria were compared to identify any differences. Two main comparisons were made. Firstly, diagnostic criteria which were included in survey responses from the Harrington study were compared with the key subjective and objective criteria used in the AIMA-ULDs study. Matching criteria from this comparison are indicated by **bold** typeface (See Table 2.I.1).

Secondly, the surveillance criteria selected by consensus in the Harrington et al study were compared with the key AIMA-ULDs criteria. Matches are indicated by **bold underline** typeface. It was intended that the Harrington surveillance criteria should replace the key AIMA-ULDs criteria and all other criteria should be added to non-key criteria for the current study.

Table 2.I.1 shows the typefaces used for comparisons, and implications for the criteria to be used in the current study. The results of the comparison were put to the Project Steering Group for discussion.

Table 2.I.1
Typefaces used for comparisons and implications for current criteria

	included in HARRINGTON ET AL. SURVEILLANCE CRITERIA	**included in** HARRINGTON ET AL. CONSENSUS CRITERIA	**NOT included in** HARRINGTON ET AL. CONSENSUS CRITERIA
included in SINCLAIR ET AL. KEY LITERATURE CRITERIA	**given in <u>BOLD UNDERLINE</u>**	**given in BOLD** (to remove from Key to Non-key)	given not bold (to remove from Key to Non-key)
NOT included in SINCLAIR ET AL. KEY LITERATURE CRITERIA	given not bold (to add to Key)	given not bold (to add to Non-key)	not shown

2.I.3 Results

Table 2.I.2 shows the comparisons between the two sets of diagnostic criteria.

Table 2.I.2
Comparisons between sets of diagnostic criteria and criteria changes for current study

SYNDROME	HARRINGTON ET AL. CONSENSUS CRITERIA			SINCLAIR ET AL. LITERATURE CRITERIA		CHANGES TO BE MADE TO KEY AIMA-ULD S CRITERIA FOR CURRENT STUDY	
	Definition	**Responses**	**Surveillance criteria**	**Key** SUBJECTIVE OBJECTIVE	**Non-key** SUBJECTIVE	to add to **Key criteria**	to remove from **Key criteria**
Carpal tunnel syndrome	A clinical syndrome caused by compression of the median nerve as it passes through the carpal tunnel	Responses: 45 • **Sensory symptoms-median nerve distribution** 91% • Abnormal nerve conduction tests 80% • **Positive Phalen's test** 50% • **Positive Tinel's test** 43% • **Weakness/wasting** 41% • **Sensory loss** 39% • **Nocturnal exacerbation** 25%	• **Pain** OR **paraesthesia** OR **sensory loss in the median nerve distribution** AND • one of: **Tinel's test positive**, **Phalen's test positive**, **nocturnal exacerbation of symptoms**, **motor loss with wasting of abductor pollicis brevis**, abnormal nerve conduction time	**Pain, paresthesia, numbness & tingling in median nerve distribution of hand** Symptoms especially aggravated by prolonged full active hand flexion **Nocturnal exacerbation of symptoms** **Diminished sensitivity to touch in median nerve distribution** **Apparent weakness/clumsiness in hand** **Positive Phalen's wrist flexion test** **Positive Tinel's sign** Loss of sensation may be tested with either pinprick, vibration, 2 point discrimination or monofilament hairs **Weakness of abductor pollicis brevis and opponens pollicis**	Paresthesia may also radiate proximally to the elbow Symptoms become most marked in the early hours of the morning, often waking the patient from sleep and causing her to shake the hand or hang it over the side of the bed Wasting of the thenar eminence	abnormal nerve conduction time	numbness & tingling in median nerve distribution of hand Symptoms especially aggravated by prolonged full active hand flexion Loss of sensation may be tested with either pinprick, vibration, 2 point discrimination or monofilament hairs

SYNDROME	**Definition**	**Responses**	**Surveillance criteria**	**Key** SUBJECTIVE OBJECTIVE	**Non-key** SUBJECTIVE	to add to **Key criteria**	to remove from **Key criteria**
Tenosynovitis of the wrist	Inflammation of the extensor and/or flexor tendon sheaths at the wrist	Responses: 41 Inflammation 74% • **Pain (all types)** 87% • **Pain (specified movement)** **resisted active** 36% **passive** /stretch 21% usage 31% **rest** 5% • **Crepitus** 79% • **Swelling** 77% • **Tenderness** 46% • Erythema 13% • **Weakness** 13% • Warmth 8% • **Reduced function** 5% • **Reduced movement** 5%	• **Pain on movement localised to the affected tendon sheaths** AND • **reproduction of pain by resisted active movement of the affected tendons with the forearm stabilised**	**Localised pain, over affected tendon / muscle- tendon structure - dull ache at rest, greatly exaggerated on motion of the tendon** **Swelling,** over affected tendon / muscle-tendon structure - localised if the condition affects tendons with a definite sheath **Crepitation** along the tendon is detectable on movement, with intensification of the symptoms, but is by no means found in every case of tenosynovitis **Often an associated weakness of the extremity in gripping because of the pain** --- **Tenderness** to palpation along the course of the tendon or muscle-tendon junction **Swelling** to palpation, over affected tendon / muscle- tendon structure - localised if the condition affects tendons with a definite sheath; diffuse if the condition affects the peritendinous tissue of tendons which have no sheath **Crepitation** along the tendon may be detectable on resisted and possibly passive movements, and is usually palpable, but in some cases it can only be detected during auscultation with a stethoscope **Pain over affected tendon / muscle-tendon structure exacerbated by resisted motions** **Weakness of the extremity in gripping / asymmetric grip strength**	Pain may sometimes be neuralgic in character Swelling that is fusiform in shape appears in more severe cases The swelling may be covered by hot and reddened skin The swelling is edematous in nature Sausage-like thickening along the course of the tendon Burning or numbness in the tips of the fingers which is to be ascribed to direct nerve pressure Disability is pronounced from the outset, and is aggravated upon attempts at activity Away from the area of the tendon sheath this may be called peritendinitis	reproduction of pain by resisted active movement of the affected tendons with the forearm stabilised	Swelling Crepitation Often an associated weakness of the extremity in gripping because of the pain Tenderness to palpation along the course of the tendon or muscle-tendon junction Weakness of the extremity in gripping / asymmetric grip strength

SYNDROME	**Definition**	**Responses**	**Surveillance criteria**	**Key** SUBJECTIVE OBJECTIVE	**Non-key** SUBJECTIVE	to add to **Key criteria**	to remove from **Key criteria**
De Quervain's disease of the wrist	Painful swelling of the first extensor compartment containing extensor pollicis brevis and adductor pollicis longus	Responses: 36 • **Pain / tenderness over radial styloid** 78% • **Exacerbated by thumb extension** 56% • **Positive Finkelstein's test** 64% • **Swelling/thickening 1st extensor compartment** 64% • **Crepitus** 17% • **Pain on thumb adduction** 5% • Triggering 5%	• **Pain which is centred over the radial styloid** AND • **tender swelling of first extensor compartment** AND • EITHER **pain reproduced by resisted thumb extension** OR **positive Finkelstein's test**	**Pain on dorsal radial aspect of wrist / in anatomic snuffbox** which may radiate up the radial side of the forearm or down into the thumb **Pain on thumb movement**, or on certain movements of the wrist **Sometimes swelling at or just proximal to the radial styloid** **Sometimes crepitus** over the first dorsal compartment Grip / pinch grasp is weak **Finkelstein's test** consists of passive ulnar deviation of the wrist with the thumb held adducted into the palm by the patient: a positive test elicits sharp pain along the line of the aforementioned tendons / region of the radial styloid (To minimise false positive tests, the ulnar deviation stress should be applied to the metacarpal of the index finger, rather than the thumb) **Pain on resisted extension and abduction of the thumb** **Local tenderness on palpation at the radial styloid / over the 1st tendon compartment** **Sometimes swelling at or just proximal to the radial styloid** **Sometimes crepitus** over the first dorsal compartment Grip / pinch grasp is weak	Difficult to pull thumb back & away from hand Some cases, swelling, redness, warmth may be seen along the line of the tendon May be palpable thickening, ganglion cyst formation, over the first dorsal compartment, that moves with flexion and extension of the thumb May be interference with sleep because of pain and discomfort	pain reproduced by resisted thumb extension	Pain which may radiate up the radial side of the forearm or down into the thumb Pain on certain movements of the wrist Sometimes crepitus over the first dorsal compartment Grip / pinch grasp is weak Pain on resisted extension and abduction of the thumb Sometimes crepitus over the first dorsal compartment Grip / pinch grasp is weak
Non-specific diffuse forearm pain	Pain in the forearm in the absence of a specific diagnosis or pathology	Responses: 31 • Pain in forearm 76% • Absence of other causes 53% • Tender muscles 23% • Reduced grip strength 20% • Unpleasant sensations 17% • Related to work 17% • Functional loss 13%	• Pain in the forearm AND • failure to meet the diagnostic criteria for other specific diagnoses and pathologies	Not available	Not available	Pain in the forearm AND failure to meet the diagnostic criteria for other specific diagnoses and pathologies	

SYNDROME	**Definition**	**Responses**	**Surveillance criteria**	**Key** SUBJECTIVE OBJECTIVE	**Non-key** SUBJECTIVE	to add to **Key criteria**	to remove from **Key criteria**
Lateral epicondylitis	A 'lesion' at the common extensor origin of the lateral epicondyle of the humerus causing the effects noted in the surveillance criteria given	Responses: 42 • **Epicondylar pain** 76% • **Pain on resisted extension** 80% • **Epicondylar tenderness** 73%	• **Lateral epicondylar pain** AND • **epicondylar tenderness** AND • **pain on resisted extension of the wrist**	**Pain localised to the lateral epicondyle** during rest **Pain localised to the lateral epicondyle during active motion of wrist** and fingers Pain and/or weakness in gripping (shaking hands / holding heavy objects) **Pain may radiate down to the dorsum of the wrist** --- **Local tenderness on or just inferior to lateral epicondyle**, at the origin of the common extensor tendons(during palpation) **Pain over the lateral aspect of the elbow reproduced / made worse by resisted extension of wrist** (and fingers) with elbow fully extended Pain and/or weakness in gripping (particularly at arm's length)	Pain may spread up and down the upper limb The range of movement of the elbow is usually normal but loss of a few degrees of extension is found in some severe and chronic cases	-	Pain localised to the lateral epicondyle during active motion of wrist and fingers Pain and/or weakness in gripping (shaking hands / holding heavy objects) Pain may radiate down to the dorsum of the wrist Pain and/or weakness in gripping (particularly at arm's length)
Shoulder Capsulitis (Frozen Shoulder)	A condition characterised by current or past pain in the upper arm, with global restriction of glenohumeral movement in a capsular pattern	Responses: 42 • **Restricted movement (active and passive)** 98% • **Pain at shoulder** 76% • **Characteristic time course** 26% • Reduced synovial volume (arthroscopy / MRI 17% • Joint tenderness 14% • **No radiological abnormality** 12% • History of triggering event / condition 12%	• **History of** unilateral **pain in the deltoid area** AND • **equal restriction of active and passive glenohumeral movement** in a capsular pattern (**external rotation > abduction > internal rotation)**	**Pain in shoulder, which is often severe** and worse at night **Gradual onset of stiffness and pain, during last three to four months** Limitation of movements in the shoulder, often severe with **virtually no gleno-humeral movements possible** In milder cases rotation and abduction, are especially affected --- **Restriction of active and passive motion** in three planes: abduction, and internal and external rotation, **particularly external rotation**- diagnosis with passive glenohumeral abduction less than 90 or passive internal rotation less than 45 or passive external rotation less than 45 **Radiographs are usually normal unless there is an associated condition** **Pain during active and passive movements of shoulder joint**, resisted movements non-painful	Thickening and inflammation of the shoulder joint (gleno-humeral) capsule Pain often referred to the insertion of the deltoid Pain, often related to activity Chronic stage the shoulder is relatively painless when immobile Painful shoulder, often during rest atrophy of the shoulder muscles	unilateral pain in the deltoid area equal restriction of active and passive glenohumeral movement in a capsular pattern (external rotation > abduction > internal rotation)	Pain often severe and worse at night Gradual onset of stiffness and pain, during last three to four months Limitation of movements in the shoulder, often severe with virtually no gleno-humeral movements possible In milder cases rotation and abduction, are especially affected

SYNDROME	**Definition**	**Responses**	**Surveillance criteria**	**Key** SUBJECTIVE OBJECTIVE	**Non-key** SUBJECTIVE	to add to **Key criteria**	to remove from **Key criteria**
Shoulder Tendonitis: Rotator cuff The current criteria differentiate between rotator cuff tendonitis and bicipital tendonitis. Harrington et al. (op cit.) also make this distinction.	Symptomatic inflammation or degeneration of the tendons of the rotator cuff or biceps	Responses (Shoulder Tendonitis): 30 • **Shoulder pain** (all forms) 90% Pain - specified • **Pain on resisted active movement** 76% • **Pain on abduction** - supraspinatus 47% • **Pain on external rotation** - infraspinatus or teres minor 20% • **Pain on internal rotation** -subscapularis 20% • **Tenderness** 43% • Impingement 17%	• **history of pain in the deltoid region** AND • **pain on one or more resisted active movements (abduction** - supraspinatus; **external rotation** - infraspinatus, teres minor; **internal rotation**- subscapularis).	(Rotator Cuff Tendinitis / Supraspinatous Tendinitis / Subdeltoid Bursitis / Subacromial Bursitis / Partial Tear of Rotator Cuff) **Local pain in the shoulder region, exacerbated by a glenohumeral movements / abduction or elevation of the arm** Symptoms become more severe and there may be pain at rest, especially in bed at night **Limited active abduction of the arm** (possibly not necessary for diagnosis) **Painful arc on active/resisted** /isometric **abduction** becomes severe as the arm approaches the horizontal position **Pain on resisted internal/external rotation possible** **Local tenderness** in the rotator cuff / on the supraspinatous tendon during palpation, especially over the humeral head and lateral to and just below the bony acromion process **Limited active abduction of the arm** (possibly not necessary for diagnosis)	Dull ache localised to the deltoid area without neck or arm radiation Discomfort on rotation of the arm from the shoulder as in reaching into a hip pocket or fastening bra Restriction of rotation of the arm Normal passive movements Reduced stability & mobility of shoulder Reflectory splinting of the humerus No symptoms of distal paresthesia 'Catch' on movement Weakness is uncommon Inflammation, either in the tendon or bursa, may be superimposed at any time	-	Symptoms become more severe and there may be pain at rest, especially in bed at night Limited active abduction of the arm (possibly not necessary for diagnosis) Painful arc on isometric abduction - becomes severe as the arm approaches the horizontal position Local tenderness
Shoulder Tendonitis: Biceps	Symptomatic inflammation or degeneration of the tendons of the rotator cuff or biceps	Responses (Shoulder Tendonitis): 30 • **Shoulder pain** (all forms) 90% Pain - specified • **Pain on resisted active movement** 76% • **Pain on abduction** - supraspinatus 47% • Pain on external rotation - infraspinatus or teres minor 20% • Pain on internal rotation - subscapularis 20% **Tenderness** 43% • Impingement 17%	• **history of anterior shoulder pain** AND • **pain on resisted** active flexion of elbow or **supination of the forearm**	(Bicipital (Humeral) Tendinitis) **Local pain in the shoulder region which seems to radiate more commonly to the anterior aspect of the arm, exacerbated by a glenohumeral movements / abduction or elevation or supination of the arm** **Limited movement / abduction of the arm** **Yergason's sign- pain over the long head of the biceps in front of the shoulder on resisted supination of the forearm with the elbow flexed at 90** **Painful arc on active/resisted** /isometric **abduction of arm**	Local pain that is often bothersome at night Reflectory splinting of the humerus	pain on resisted active flexion of elbow	Pain exacerbated by a glenohumeral movements / abduction or elevation or supination of the arm Limited movement / abduction of the arm Painful arc on active/resisted /isometric abduction of arm Local tenderness

SYNDROME	**Definition**	**Responses**	**Surveillance criteria**	**Key** SUBJECTIVE OBJECTIVE	**Non-key** SUBJECTIVE	to add to **Key criteria**	to remove from **Key criteria**
Thoracic Outlet Syndrome	A constellation of symptoms and signs in the upper limb/hand caused by compression of the neurovascular bundle at the thoracic outlet	Responses: 33 • Neurological abnormalities- ulnar distribution 84% • Reduced blood flow- various signs 66% • Cervical rib or band 54% • Nerve conduction defects 30% • Wasting of hand muscles 24% • Abnormal vascular imaging 24% • Raynauds, ischaemia, embolism 21% • Symptoms from specific movements/ postures 21% • Subclavian bruit 9%		Symptoms exacerbated by abduction of arm Paresthesiae, pins and needles, numbness, and diminished sensation in median or ulnar distribution, more often the latter / in the distribution of the C8/T1 nerve roots, first noticed in the finger tips and progressing centripetally to involve more of the hands and arms Pain that is of varying consistency, aching to severe, constant or intermittent; radiating from the cervical spine area, supraclavicular space, or shoulder; and extending into the arm, forearm, or hand in the distribution of the ulnar nerve - over the supraclavicular space, medial aspect of the forearm to the ulnar aspect of the hand Fatigability / weakness of grip / intrinsic muscles of the hand and forearm / in the distribution of the C8/T1 nerve roots Pale, cold, or numb fingers --- Positive Roo's test - three minutes of abduction and external rotation of the shoulder causing pain, early fatigue and paresthesiae in the ulnar nerve distribution Positive Allen's hyperabduction or costoclavicular compression test Diminished sensation in median or ulnar distribution, more often the latter / in the finger tips Fatigability / weakness of grip / intrinsic muscles of the hand and forearm / in the distribution of the C8/T1 nerve roots Positive Adson's test - diminution of the (radial) pulse with the patient's arm dependent and the patient's head turned towards the affected side whilst performing a Valsalva manoeuvre	Drooping shoulders Symptoms may be worse when carrying heavy objects Symptoms can be exacerbated by actions such as combing the hair, painting walls, or hanging pictures Problem holding small objects / clumsiness of the hands Atrophy / wasting of the thenar, hypothenar and intrinsic muscles of the hand Upper extremity claudication Cyanosis and swelling of the distal parts of the extremity may occur Arm may feel as if it is going to sleep As the injury to the subclavian artery progresses, intimal disruption with ulceration and emboli to the distal extremity may occur and can result in gangrenous changes of a digit Ultimately, aneurysm formation and/or thrombosis may result Nocturnal exacerbation	-	-

2.I.4 CONCLUSIONS

Several additions were required to the Sinclair et al (op cit) key criteria to bring these in line with the surveillance criteria identified by Harrington et al (op cit). Syndromes covered by the aid which were affected included:

- Carpal Tunnel Syndrome
- De Quervain's Tenosynovitis
- Tenosynovitis/Tendinitis/Peritendinitis
- Non-specific hand/wrist/forearm pain
- Frozen Shoulder
- Bicipital Tendonitis

The criteria which were added to the key criteria to be used in the current study from the Harrington et al surveillance criteria were as follows:

- "abnormal nerve conduction time" was added to the key criteria for Carpal Tunnel Syndrome
- "reproduction of pain by resisted active movement of the affected tendons with the forearm stabilised" was added to the key criteria for Tenosynovitis
- "pain reproduced by resisted thumb extension" was added to the key criteria for De Quervain's Tenosynovitis and "De Quervain's Disease" was adopted as the label
- "Pain in the forearm AND failure to meet the diagnostic criteria for other specific diagnoses and pathologies" was added to the key criteria for non-specific hand/wrist/forearm pain and "non-specific diffuse forearm pain" was adopted as the label
- "unilateral pain in the deltoid area and equal restriction of active and passive glenohumeral movement in a capsular pattern (external rotation > abduction > internal rotation)" were added to the key criteria for Frozen Shoulder
- "pain on resisted active flexion of the elbow" was added to the key criteria for Bicipital Tendonitis

The final stage of aid development, before the aid was tested with Occupational Physicians, involved discussion with the project group rheumatologist. With reference to the modified ULD criteria, the diagnostic aid was re-drafted and circulated to the Project Steering Group for agreement.

2.I.5 REFERENCES

HARRINGTON, J. M., CARTER, J. T., BIRRELL, D, and GOMPERTZ, D., 1998, Surveillance Case Definitions for Work Related Upper Limb Pain Syndromes, *Occupational and Environmental Medicine*, **55**, 264-271

SINCLAIR D T, GRAVES R J, WATT M, RATCLIFFE B, DOHERTY S, 1997, Feasibility Of Developing A Decision Aid For Initial Medical Assessment Of Ulds, *Contemporary Ergonomics*, Taylor & Francis

APPENDIX 3.A
Evaluation Forms to Assess Usability of AIMA-ULD

The following evaluation form should be completed **each time** the Aid has been used to diagnose an upper limb complaint.

First, please note your *initial working diagnosis before* using Parts B to E of the Aid, and the *final diagnosis* recommended by the Aid.

Initial working diagnosis before using Aid_____

Final diagnosis recommended by Aid_____

For the following statements, please indicate the extent to which you agree with the statement by ticking one of the boxes to the right of the statement.

		Strongly Agree	**Agree**	**Not Sure**	**Disagree**	**Strongly Disagree**
(1)	Using the Aid helped me to reach a more accurate diagnosis.	☐	☐	☐	☐	☐
(2)	A flowchart diagnostic aid could not be expected to refine my initial working diagnosis for this disorder.	☐	☐	☐	☐	☐
(3)	The information in the Aid helped me to make a more informed decision about the diagnosis.	☐	☐	☐	☐	☐
(4)	I found it difficult to use the Aid to diagnose this disorder.	☐	☐	☐	☐	☐
(5)	I found the Aid to be useful for judging the work-relatedness of this disorder.	☐	☐	☐	☐	☐
(6)	My management plan for this disorder was supported by the prompts given on the Aid.	☐	☐	☐	☐	☐
(7)	The time taken to use the Aid was acceptable in view of its benefits to this consultation.	☐	☐	☐	☐	☐

APPENDIX 3.B
Field Trial Questionnaire

* This questionnaire should NOT be completed until directly AFTER the eight week trial period.
* You should REFER to the AIMA-ULD when completing this questionnaire.
* Please take your time to answer fully all the questions.

BACKGROUND INFORMATION

Firstly, we would be grateful if you could give us some background information about your medical experience.

Question 1
How many *years or months* **of experience have you had in the following fields of medicine?**

Occupational Medicine _____
General Practice _____
Orthopaedics _____
Rheumatology _____

Question 2
On *average***, how often are you presented with Upper Limb complaints in your practice?**

At least *five* times every *week* ☐
At least *three* times every *week* ☐
At least *once* every *week* ☐
At least *once* every *month* ☐
Less than *once* a *month* ☐

THE DIAGNOSTIC AID

Each of the questions which follows consists of:
(i) a statement about the Aid, with which you must indicate your level of agreement, and
(ii) a query asking how the Aid could be improved.

Please indicate your level of agreement with each statement by ticking **one** of the boxes directly after it. Then, following each statement, write clearly your views on how the design of the Aid could be improved. If you need more space to write, please use the additional sheet at the end of this booklet, on page **B7**.

Part A - The Aide Memoire

Question 3
Part A clearly directed me to the appropriate section of the Aid.

Strongly agree ☐ Agree ☐ Not Sure ☐ Disagree ☐ Strongly disagree ☐

What do you think could be changed about Part A so that it more clearly directs its users to the appropriate section of the Aid?

Question 4
Part A should be changed as it is of limited use in its current form.

Strongly agree ☐ Agree ☐ Not Sure ☐ Disagree ☐ Strongly disagree ☐

How would you change Part A to make it more useful?

Parts B & C - The Decision Aid Flowcharts

Question 5
The symptoms and signs given in *column 1 of Part B* **of the Aid make it easy to differentiate initially between syndromes.**

Strongly agree ☐ Agree ☐ Not Sure ☐ Disagree ☐ Strongly disagree ☐

What changes would you make to the symptoms and signs given in column 1 of Part B to make it easier to differentiate between syndromes?

Question 6
The symptoms and signs given in *column 1 of Part C* of the Aid make it easy to differentiate initially between syndromes.

Strongly agree ☐ Agree ☐ Not Sure ☐ Disagree ☐ Strongly disagree ☐

What changes would you make to the symptoms and signs given in column 1 of Part C to make it easier to differentiate between syndromes?

Question 7
The disorders are listed in a useful order in *Part B* of the Aid which allows the process of elimination to flow logically.

Strongly agree ☐ Agree ☐ Not Sure ☐ Disagree ☐ Strongly disagree ☐

In what way would you re-sequence the syndromes in Part B so that the process of elimination flowed more logically?

Question 8
The disorders are listed in a useful order in *Part C* of the Aid which allows the process of elimination to flow logically.

Strongly agree ☐ Agree ☐ Not Sure ☐ Disagree ☐ Strongly disagree ☐

In what way would you re-sequence the syndromes in Part C so that the process of elimination flowed more logically?

Question 9
The Aid covers an appropriate choice of syndromes to provide diagnostic support for a variety of complaints.

Strongly agree ☐ Agree ☐ Not Sure ☐ Disagree ☐ Strongly disagree ☐

Are there any syndromes which you feel should be added to or removed from the Aid?

Question 10
The cross-referencing between disorders on the Aid (e.g. "*Check*" arrows between shoulder disorders, or "*Check for*" prompts in column 2) **allows a comprehensive check to be made for disorders with overlapping symptoms.**

Strongly agree ☐ Agree ☐ Not Sure ☐ Disagree ☐ Strongly disagree ☐

Are there any additional syndromes which you feel should be cross referenced?

Question 11
The action-related risk factors given in *column 3 of Parts B & C* **are useful when considering how to deal with the causes of a disorder.**

Strongly agree ☐ Agree ☐ Not Sure ☐ Disagree ☐ Strongly disagree ☐

Is there anything you would change about the action-related risk factors to increase the level of support they provide?

Question 12
The confirmatory signs in *column 4 of Parts B & C* **are comprehensive enough to support a differential diagnosis.**

Strongly agree ☐ Agree ☐ Not Sure ☐ Disagree ☐ Strongly disagree ☐

What confirmatory signs would you add to Parts B or C to improve the support they provide?

Parts D & E - Tables of Supplementary Information

Question 13
The layout of *Parts D & E* **make them easy to use.**

Strongly agree ☐ Agree ☐ Not Sure ☐ Disagree ☐ Strongly disagree ☐

What would you change about Parts D & E to make the layout more user friendly?

Question 14
Parts D & E **contain sufficient symptoms and signs to help in the confirmation of a diagnosis.**

Strongly agree ☐ Agree ☐ Not Sure ☐ Disagree ☐ Strongly disagree ☐

What confirmatory symptoms and signs would you add to Parts D or E to increase the level of support they provide?

Question 15
The risk factors listed in *Parts D & E* **are a useful source of reference when considering how to deal with the causes of a disorder.**

Strongly agree ☐ Agree ☐ Not Sure ☐ Disagree ☐ Strongly disagree ☐

What would you change about the risk factors listed so they were more useful for considering a disorder's causation?

FINAL DESIGN OF THE AID

In the following two questions, a number of design ideas are suggested on the presentation of the final version of the Aid. Please indicate your level of agreement with ***each*** idea by ticking one box.

Question 16

The following are important features of how the final version of the Aid should be packaged:

	Strongly Agree	Agree	Not Sure	Disagree	Strongly Disagree
i) Colour coding of the Aid to make cross-referencing easier	☐	☐	☐	☐	☐
ii) Attachment of index tabs to pages in the Aid to support cross-referencing	☐	☐	☐	☐	☐
iii) Lamination of Parts A, B & C of the Aid	☐	☐	☐	☐	☐
iv) Production of the Aid in a fold-out format, suitable to be kept in a drawer	☐	☐	☐	☐	☐
v) Provision of check boxes on the Aid for note-making during a consultation	☐	☐	☐	☐	☐

Question 17

The following would be useful additions to the final version of the Aid:

	Strongly Agree	Agree	Not Sure	Disagree	Strongly Disagree
i) Reference document with additional information to confirm diagnosis	☐	☐	☐	☐	☐
ii) Literature references on the Aid for doctors who want more information	☐	☐	☐	☐	☐
iii) Supplementary document (e.g. diagrams) to support physical examination	☐	☐	☐	☐	☐
iv) Additional information on work-related physical risk factors	☐	☐	☐	☐	☐
v) Supplementary information on psychosocial risk factors	☐	☐	☐	☐	☐

Please write below any additional suggestions you have for improving the Aid.

Please use this space to write any further views you have on the effectiveness and usability of the AIMA-ULD.

THANK YOU VERY MUCH FOR YOUR HELP

Please return this entire document to: **AIMA-ULD Field Trials, Environmental and Occupational Medicine, FREEPOST, Ashgrove Road West, Aberdeen, AB9 7AR**, using the Freepost envelope provided.

APPENDIX 4.A
PRE-TRIAL QUESTIONNAIRE

* This questionnaire must be completed prior to participation in the study trials. It will allow the researchers to assign you to an experimental or control group, such that each of these groups is balanced in terms of ULD knowledge and experience.
* Please take your time to answer fully all the questions.

NAME_____ DATE_____

Question 1

How many *years or months* of experience have you had in the following fields of medicine? (please indicate whether or not each is full-time)

	Period	Full time?
Occupational Medicine	_____	☐
General Practice	_____	☐
Orthopaedics	_____	☐
Rheumatology	_____	☐
Other (please specify)	_____	☐

Question 2

On *average*, how often are you presented with Upper Limb complaints in your practice?

At least *eight* times every *week*	☐	At least *once* every *week*	☐
At least *five* times every *week*	☐	At least *twice* every *month*	☐
At least *three* times every *week*	☐	At least *once* every *month*	☐
At least *twice* every *week*	☐	*Less* than *once* a *month*	☐

Question 3 (*Occupational Physicians only*)

Please indicate your qualifications in Occupational Medicine.

FFOM ☐ MFOM ☐ AFOM ☐ Other ☐ (please specify)_____

Question 4 (*Occupational Physicians only*)

Please indicate your work sector (e.g. manufacturing, healthcare, etc.).

Question 5

Have you taken any courses which would be likely to enhance your knowledge of Upper Limb Disorders?

Yes ☐ No ☐

If yes, please describe these courses briefly, and indicate which courses were taken within the last 12 months.

Title of course	Year taken	Number of hours	Topics covered

Question 6

Do you have any prior knowledge of this research project, other than the information we provided when inviting you to participate in the study?

Yes ☐ No ☐

If yes, have you seen any part of the decision support aid?

Yes ☐ No ☐

Question 7

Do you know of other doctors who might be interested in helping with this study?

Yes ☐ No ☐

If yes, could you please give contact details in the space below.

APPENDIX 4.B
QUESTIONNAIRE TO ASSESS OVERALL EFFECTIVENESS AND USABILITY OF AID

This questionnaire should NOT be completed until directly AFTER the ten consultations.

You should REFER to the Aid when completing this questionnaire.

NAME_____**DATE**_____

For the following statements, please indicate the extent to which you agree with the statement by ticking one of the boxes to the right of the statement.

	Strongly Agree	**Agree**	**Not Sure**	**Disagree**	**Strongly Disagree**
(1) Using the Aid helped me to reach a diagnosis which I felt was more accurate.	☐	☐	☐	☐	☐
(2) The information in the Aid helped me to make a more informed decision about my diagnoses.	☐	☐	☐	☐	☐
(3) I found it difficult to use the Aid to diagnose disorders.	☐	☐	☐	☐	☐
(4) I found the Aid to be useful for judging the action-relatedness of disorders.	☐	☐	☐	☐	☐
(5) My management plan for disorders would be supported by the prompts given on the Aid.	☐	☐	☐	☐	☐
(6) The time taken to use the Aid would be acceptable in view of its benefits to the consultation.	☐	☐	☐	☐	☐

APPENDIX 5

University of Aberdeen
Department of Environmental and Occupational Medicine

Development and Evaluation of Decision Support Aid for Initial Diagnosis of Upper Limb Disorders for Occupational Medicine

UNIT 2- DECISION SUPPORT AID FOR THE INITIAL DIAGNOSIS OF UPPER LIMB DISORDERS

Decision Support Aid for Initial Diagnosis of Upper Limb Disorders *
Part A - Aide Memoire

* Those who use the Aid infrequently should refer to the training & reference handbook

START

The following checklist can be used as a memory aid if you wish.
It outlines the information which is needed to proceed to Part B or C.

Presenting symptoms:

1. Site, distribution, radiation of the symptoms
2. Character and severity (intensity, frequency, duration) of symptoms
3. Pain at other sites
4. Associated symptoms

History of patient background:

1. Individual and family medical history (including, e.g. rheumatological factors, diabetes mellitus, etc.)
2. Patient's activities (i.e. leisure, household, work)
3. Psychosocial factors

General Systems Review:

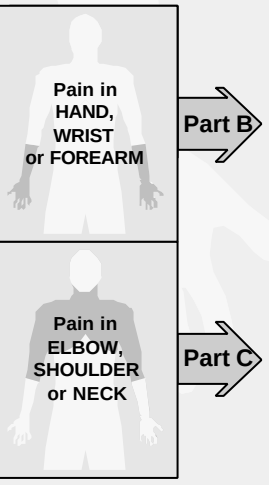
1. Gastro-intestinal
2. Cardio-vascular
3. Respiratory
4. Central Nervous

N.B. Referred pain (e.g. Angina Pectoris, Oesophagitis)

Do symptoms include **musculoskeletal pain** in **upper limb**?

Yes

Proceed to diagnostic aids attached (including physical examination)



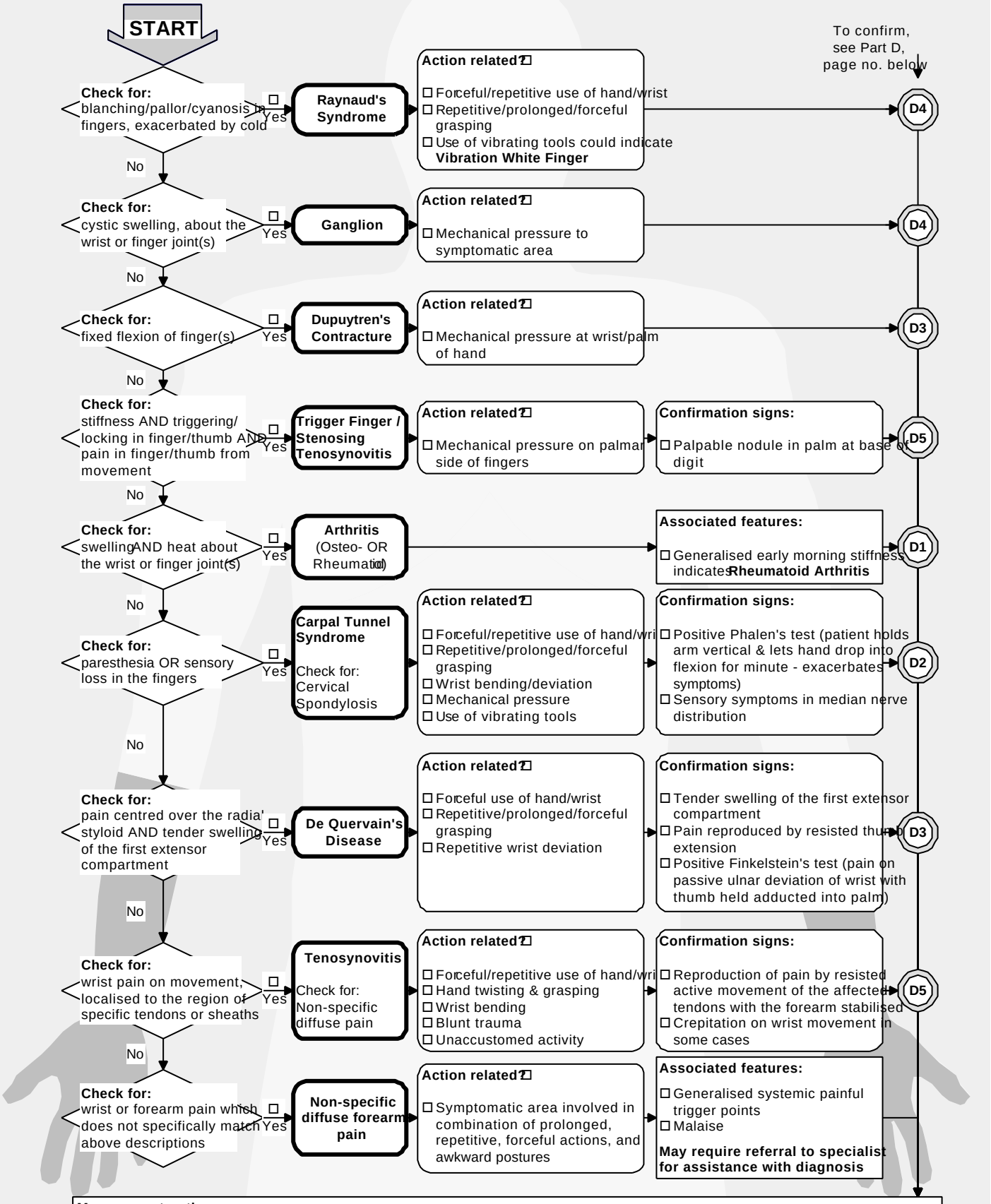
Part B

Part C

No

Continue with normal diagnostic procedures
(including physical examination)

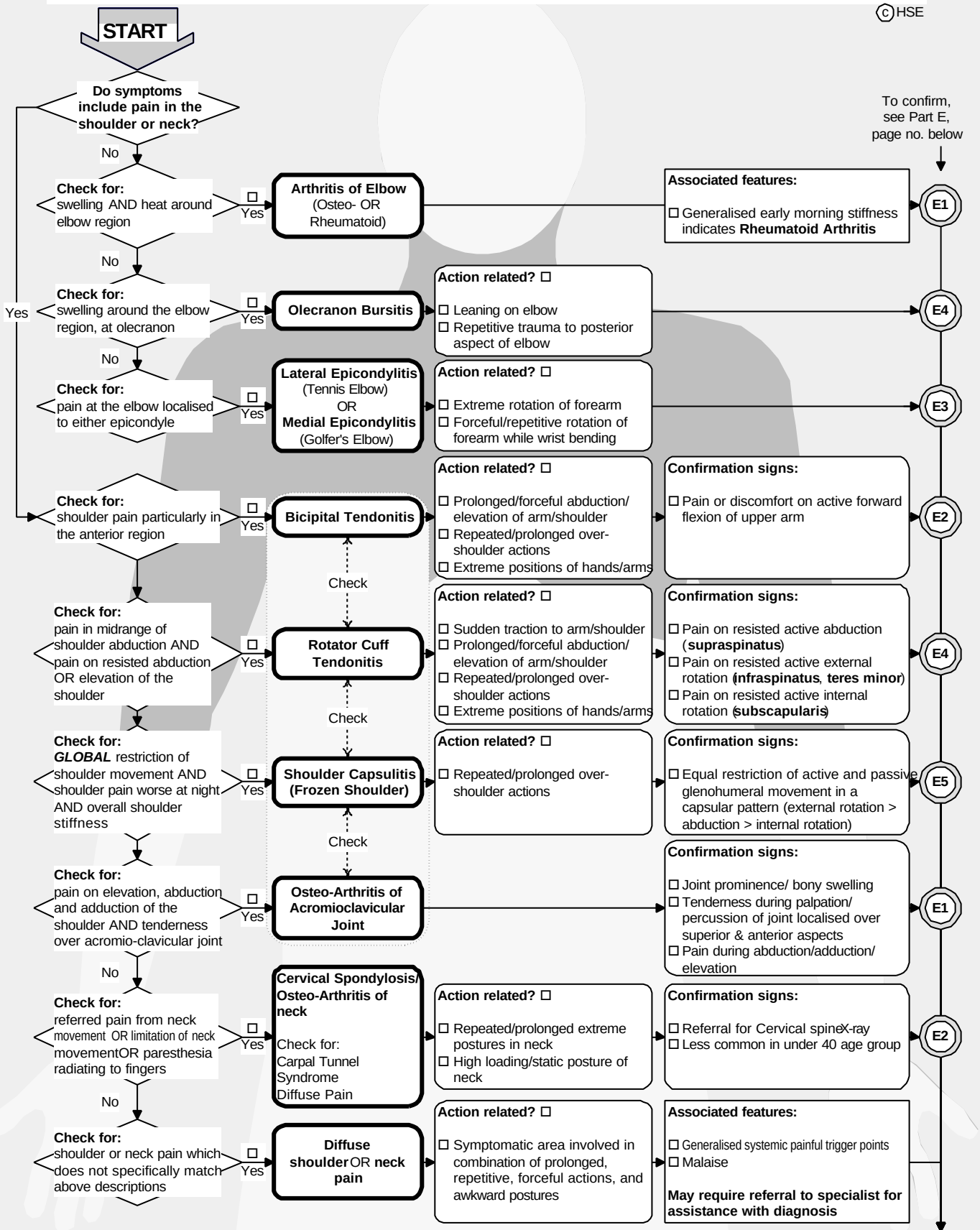
Part B - Diagnostic Decision Aid for Symptoms of Pain in HAND, WRIST or FOREARM



Management options:

- ☐ **Physical:** Eliminate/reduce activities/actions which may contribute to problem; Immobilise/support/splint affected area; Physi
- ☐ **Pharmacological:** Anti-inflammatories; Analgesics; Specific therapy
- ☐ **Hospital referral:** Orthopaedic surgeon; Rheumatologist; Neurologist
- ☐ **Occupational referral:** Occupational Physician; Employment medical adviser

Part C - Diagnostic Decision Aid for Symptoms of Pain in ELBOW, SHOULDER or NECK



Part D - Tables of Supplementary Information for Confirming Diagnosis: symptoms, signs & apparent risk factors of HAND, WRIST & FOREARM disorders

Disorders are listed in alphabetical order

Arthritis (Osteo-Arthritis) in lower arm
Symptoms & Signs
• Swelling • Early morning stiffness • Pain on palpation and movement of affected joint • Herbeden's nodes (bony swelling at either side of distal interphalangeal joint) • Bouchard's nodes (bony swelling at either side of proximal interphalangeal joint)

Arthritis (Rheumatoid Arthritis) in lower arm
Symptoms & Signs
• Early morning stiffness • Symmetric joint swelling • Increased local heat particularly symmetric small joints of the hands • Joint tenderness particularly symmetric small joints of the hands • Joint pain on movement, particularly symmetric small joints of the hands • Hand radiological changes • Swelling / deformity of metacarpophalangeal (MCP) or proximal interphalangeal (PIP) joint
Apparent Risk Factors
• Family history

Carpal Tunnel Syndrome

Median nerve compressed as it enters the palm due to tendon sheath swelling in the carpal tunnel

Symptoms & Signs

- Paresthesia or loss of sensation in median nerve distribution
- Positive flick sign *[1]
- Apparent weakness / clumsiness in hand
- Positive Phalen's wrist flexion test *[2]
- Positive Tinel's sign *[3]
- Symptoms can wake patient in early hours of morning causing them to shake hand or hang it over side of bed
- Confirm by nerve conduction studies

Risk Factors

- Extreme flexion / extension of the wrist at maximum angles
- Strong gripping with ulnar deviation
- Highly forceful and/or repetitive hand / wrist movements
- Impact forces on the palm and vibratory forces
- Exposure of nerves to hard or sharp edges: external or internal
- Repeated or sustained pinch grip
- Most common among 30-60 year olds
- Two to five times more common among women
- Dominant hand affected more frequently
- Bilateral involvement reported in 8-50% of cases
- May appear transiently during pregnancy
- Associated with use of oral contraceptives and diabetes mellitus

***1 FLICK SIGN**

The patient demonstrates a flicking action when asked what they do to relieve their symptoms.

***2 PHALEN'S WRIST FLEXION TEST**

Phalen's test consists of the patient holding their forearms vertically and allowing both hands to drop into complete flexion at the wrist for approximately one minute. If positive, the test reproduces or exacerbates the patient's symptoms of pain and paresthesia felt in the distribution of the median nerve.

***3 TINEL'S SIGN**

Tinel's test involves percussing over the carpal tunnel / median nerve at the wrist for about half a minute. If positive, the test reproduces or exacerbates the patient's symptoms of pain and paresthesia felt in the distribution of the median nerve distally.

De Quervain's Disease Of The Wrist

Repetitive excessive friction between tendon sheath and two thumb extensor tendons promotes thickening of the sheath

Symptoms & Signs

- Pain on dorsal radial aspect of the wrist in anatomic snuffbox
- Tender swelling of first extensor compartment
- May be swelling, redness, warmth along tendon
- Positive Finkelstein's test *[1]
- Pain on resisted extension and abduction of the thumb
- Pinch grasp is weak
- Sometimes crepitus over the first dorsal compartment

Apparent Risk Factors

- Pinching or grasping with wrist in radial or ulnar deviation movements
- Combinations of forceful gripping and twisting of the hand
- Repetitive wrist deviations
- More common in women
- Occurs more in the middle aged

***1 FINKELSTEIN'S TEST**

Finkelstein's test consists of passive ulnar deviation of the wrist with the thumb held adducted into the palm by the patient. A positive test elicits sharp pain along the line of the aforementioned tendons / region of the radial styloid. To minimise false positive tests, the ulnar deviation stress should be applied to the metacarpal of the index finger, rather than the thumb.

Dupuytren's Contracture

Thickening of the palmar fascia

Symptoms & Signs

- Fixed flexion of finger(s)
- Painless thickening of the palmar fascia
- Ring finger is most frequently affected, followed by the little finger and middle fingers, the index finger and then the thumb
- Small nodule at the base of the ring finger at the level of the distal palmar crease

Apparent Risk Factors

- Long periods with the palm of the hand pressed against a hard object e.g. continuous use of a hand tool
- Affects men more if they are over the age of 40
- Precipitated by trauma, then pursues a rapid course
- May be a hereditary factor or an association with epilepsy or alcoholic cirrhosis

Ganglion

Excess synovial fluid (joint lubrication) fills tendon sheath causing it to swell

Symptoms & Signs

- Cystic swelling, about wrist or finger joint(s)
- Most frequent site is the dorsum of the wrist
- Ganglions may be tense and firm or soft and fluctuant
- For small ganglia on the back of the wrist arising from the radio carpal joint; local pain, swelling and tenderness may only be obvious when the wrist is palmar flexed

Apparent Risk Factors

- Associated with a twisting movement
- Constant pressure on a localised area
- Repeated heavy lifting
- Trauma

Raynaud's Syndrome

Vasoconstriction of arteries to fingers

Symptoms & Signs

- Numbness and tingling in affected fingers
- Fingertip blanching, pallor or cyanosis induced by cold
- Gangrene and ulceration in fingers in extreme cases
- Difficulty with fine control
- Reductions in hand strength
- Problems with cold water tolerance or refrigeration may signify disease in warmer climates
- ***Vibration White Finger*** associated with history of using vibrating tools

Apparent Risk Factors

- Forceful gripping or forceful manipulations
- Prolonged use of vibrating or pneumatic tools (1 to 2 hours per day)
- Repetitive forceful movements
- Induced by cold

Tenosynovitis

Sheath stimulated to produce excess fluid which accumulates causing the sheath to become swollen

Symptoms & Signs

- Localised pain over affected tendon or muscle-tendon structure with dull ache at rest, exacerbated by movement
- Sausage-like thickening along the course of the tendon
- Crepitation along the tendon may be palpable
- Reproduction of pain by resisted active movement of the affected tendons with the forearm stabilised
- Disability pronounced from the outset and aggravated upon attempts at activity
- Acute frictional tenosynovitis occurs most frequently in the 20 to 40 age group generally following a period of excess activity

Apparent Risk Factors

- Extreme sustained positions of the hands and arms
- Persistence of strain may cause problems
- Repetitions that exceed 1500 to 2000 per hour (30 to 40 per minute)
- Repetitive gripping and twisting movements not necessarily involving heavy loads or extensive duration
- Continuous use of high speed hand operations, demanding considerable expenditure of muscular energy, persisted in for many hours daily, over long periods of time

Trigger Finger

(Stenosing Tenosynovitis)

Tendon sheath so swollen that tendon gets locked within sheath

Symptoms & Signs

- Stiffness or triggering / clicking / catching of finger or thumb on extension
- Pain in finger or thumb from movement
- Tenderness anterior to the metacarpal of the affected digit
- Finger may get locked in either flexion or extension
- Triggering particularly in the early morning

Apparent Risk Factors

- Manual forces on palmar side of fingers
- Use of tool or control handles with hard or sharp edges
- Rheumatoid arthritis one of the few recognised causes

Part E - Tables of Supplementary Information for Confirming Diagnosis: ã HSE
symptoms, signs & apparent risk factors of ELBOW, SHOULDER & NECK disorders

Disorders are listed in alphabetical order

Arthritis (Osteo-Arthritis) of Acromioclavicular Joint
Symptoms & Signs
• Pain on elevation, abduction and adduction of the shoulder • Joint prominence may be noticed • Tenderness localised over superior and anterior aspects of joint • Crepitus is common • Pain on shoulder shrug • Diagnosis can be established by radiographic evaluation

Arthritis (Osteo-Arthritis) in elbow
Symptoms & Signs
• Swelling • Pain on palpation and movement of affected joint
Apparent Risk Factors
• Heavy manual activity • May be secondary to old fracture involving the articular surfaces • May follow osteochondritis dissecans

Arthritis (Rheumatoid Arthritis) in elbow
Symptoms & Signs
• Early morning stiffness • Symmetric joint swelling • Increased local heat • Joint tenderness • Joint pain on movement • Radiological changes
Apparent Risk Factors
• Family history

E2

Bicipital Tendonitis

Symptomatic inflammation or degeneration of the tendons of the biceps

Symptoms & Signs

- Local pain in the shoulder region which seems to radiate more commonly to the anterior aspect of the arm
- Positive Speed's test *[1]
- Positive Yergasson's sign *[2]
- Discomfort on raising the arm in front (forward flexion)

Apparent Risk Factors

- Constant or repetitive abduction/elevation of the arm at the shoulder
- Machine paced assembly actions where repetitive movements of the hands reach 25000 cycles per workday
- Activities performed with the arms raised away from the sides, involving some degree of rotation of the arm from the shoulder

***1 SPEED'S TEST**

A positive test would produce discomfort upon resisted flexion of the shoulder with a supinated arm.

***2 YERGASSON'S SIGN**

A positive sign is pain over the long head of the biceps in front of the shoulder on resisted supination of the forearm with the elbow flexed at 90 degrees.

Cervical Spondylosis / Osteo-Arthritis of the neck

Symptoms & Signs

- Patient may experience paresthesia (possibly radiating to fingers)
- Pain in the neck during rest may be felt centrally or at the side, quite sharply localised, or in the supraclavicular region
- Pain radiating down to one or both shoulders / upper extremities
- Neck stiffness or limitation of movement
- Occipital headache which may be confused with migraine
- Pain radiating along the distribution of a spinal root
- Diagnosis should be confirmed radiologically

Apparent Risk Factors

- Extreme forward flexion of the cervical spine
- High load on the cervical spine
- Frequent exposure to extreme positions of the cervical spine
- Minor trauma

Lateral Epicondylitis
(Tennis Elbow)
Irritation of unsheathed tendons in elbow, inflaming tendon on lateral side of elbow

Symptoms & Signs

- Pain localised to the lateral epicondyle during rest
- Pain may radiate down to the dorsum of the wrist
- Weakness in gripping
- Muscle atrophy
- Local tenderness on or just inferior to the lateral epicondyle at the origin of the common extensor tendons
- Pain on resisted extension of the wrist with fingers flexed
- Symptoms may be precipitated by extending the middle finger against resistance

Apparent Risk Factors

- Extreme rotation of the forearm
- Repeated flexion/ extension of the wrist against resistance or repeated pronation/ supination of the forearm with the elbow extended
- Overuse of finger extensor muscles attached to the elbow
- Repeated rapid movements not necessarily involving heavy loads or extensive duration
- Jerky, throwing movements of arm
- More common in the 40 to 50 age group
- History of recent excessive activity involving the elbow

Medial Epicondylitis
(Golfer's Elbow)
Irritation of tendon attachments of finger muscles on the medial aspect of the elbow

Symptoms & Signs

- Pain localised to medial epicondyle during rest
- Pain at the common flexor origin on the medial side of the elbow
- Local tenderness on the medial epicondyle at the common flexor origin on palpation
- Pain reproduced / made worse by resisted flexion of the wrist and fingers
- Pain on resisted forearm pronation

Apparent Risk Factors

- Extreme supination / pronation of the forearm while the wrist is bent
- Forceful forearm rotation and wrist bending
- Constant overstrain of flexors
- Repeated rapid movements not necessarily involving heavy loads
- Most common between the ages of 40 and 50

E4

Olecranon Bursitis

Extra-articular collection of synovial fluid

Symptoms & Signs

- Swelling at olecranon
- Usually painless unless associated bacterial infection
- Palpable painful olecranon bursa
- Nodular masses in the proximal part of the forearm
- No pain on passive or resisted range of movement

Apparent Risk Factors

- Repeated trauma to the posterior aspect of the elbow joint
- Swelling in response to irritation, movements, and leaning on the elbow
- Swelling of the bursa is also common in rheumatoid arthritis

Rotator Cuff Tendonitis

Symptomatic inflammation or degeneration of the tendons of the rotator cuff

Symptoms & Signs

- Local pain in the shoulder region
- Dull ache localised to the deltoid area without neck or arm radiation
- Weakness is uncommon
- Pain in shoulder exacerbated by glenohumeral movements, abduction/elevation of the arm
- Limited active abduction of the arm
- Painful arc (in midrange of movement) on active / resisted / isometric abduction becomes severe as the arm approaches the horizontal position
- Normal passive movements
- Positive Impingement test *[1]
- ***Supraspinatus Tendonitis*** associated with pain on resisted active abduction
- ***Infraspinatus*** and ***Teres Minor Tendonitis*** associated with pain on resisted active external rotation
- ***Subscapularis Tendonitis*** associated with pain on resisted active internal rotation

Apparent Risk Factors

- Activities performed with the arms raised away from the sides, involving some degree of rotation of the arm from the shoulder
- Repeated forward flexions (e.g. 15 per minute for 1hr) of shoulder
- Extreme sustained positions of hands and arms
- Repetitive overhead arm movements
- High demands on arms in terms of force
- Repetitive movements of the arms reaching 25000 cycles per workday

***1 IMPINGEMENT TEST**

The observer stands behind the patient, who is seated, and elevates the patient's arm forward while keeping the scapula fixed. If pain is produced in the shoulder and is relieved by 10 mls of 1% xylocaine beneath the subacromial area / anterior edge of the acromium, then the test is regarded as positive.

E4

Shoulder Capsulitis
(Frozen Shoulder)

Symptomatic inflammation or degeneration at glenohumeral joint

Symptoms & Signs

- Pain often referred to the insertion of the deltoid
- Gradual onset of stiffness and pain during the last three to four months
- Shoulder relatively painless when immobile at the chronic stage
- Muscle spasm in the initial phase
- Interior capsular tenderness
- Restriction of active and passive movements in three planes: abduction, and internal and external rotation, particularly external rotation - diagnosis with passive glenohumeral abduction less than 90 degrees or passive internal rotation less than 45 degrees or passive external rotation less than 45 degrees
- Resisted movements are non-painful
- Pain often more severe at night

Apparent Risk Factors

- History of minor trauma
- Repeated overhead movements
- Preceding episode of a silent or overt cardiac infarct
- Attributable to fibrosis
- Patient usually female with the non dominant arm involved
- Affects middle aged who are experiencing degenerative changes in their shoulder cuffs

APPENDIX 6
TRAINING AND REFERENCE HANDBOOK FOR OCCUPATIONAL PHYSICIANS

University of Aberdeen

Department of Environmental and Occupational Medicine

Development and Evaluation of Decision Support Aid for Initial Diagnosis of Upper Limb Disorders for Occupational Medicine

TRAINING AND REFERENCE HANDBOOK

&

DECISION SUPPORT AID FOR THE INITIAL DIAGNOSIS OF UPPER LIMB DISORDERS

University of Aberdeen
Department of Environmental and Occupational Medicine

Development and Evaluation of Decision Support Aid for Initial Diagnosis of Upper Limb Disorders for Occupational Medicine

UNIT 1 - TRAINING AND REFERENCE HANDBOOK

Contents

1. Overview of pack

This pack is designed as a self-training guide to enable Occupational Physicians to learn how to use a Decision Support Aid for the Initial Diagnosis of Upper Limb Disorders (DSAID-ULD). The DSAID-ULD has been developed at the University of Aberdeen, Department of Environmental and Occupational Medicine, in a study commissioned by the Health and Safety Executive.

The following text will introduce you to the DSAID-ULD and explain how it is intended to complement your usual consultation approach. You will be informed in detail how each section of the Aid should be applied. In addition, the pack will take you through a worked example demonstrating how the Aid should be used, followed by two practical exercises in applying the Aid. Although the DSAID-ULD may appear complex at first, Occupational Physicians who used the Aid in pilot trials indicated that it was easy to use, and the exercises will show how straightforward it is to apply.

The DSAID-ULD is provided in Unit 2 of this pack. It has been bound separately so that you can refer to it while following these instructions. The DSAID-ULD consists of the following materials:

- **Part A** - an Aide Memoire which covers key elements of the consultation
- **Part B** - a Diagnostic Decision Aid for symptoms of musculoskeletal pain in the *hand, wrist or forearm*
- **Part C** - a Diagnostic Decision Aid for symptoms of musculoskeletal pain in the *elbow, shoulder or neck*
- **Parts D and E** - Tables of Supplementary Information for confirming the diagnosis (10 pages, numbered D1 to D5 and E1 to E5)

If any of these materials has been omitted, please contact the researchers immediately on **0141 576 9371**. Full contact details are provided in section 3 of this document. The researchers are also available to answer any queries about the pack in general.

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2. The Decision Support Aid for Initial Diagnosis of ULDs

2.1 Guidance on using the DSAID-ULD

While reading this section you should refer to the DSAID-ULD provided in Unit 2.

The aim of the DSAID-ULD is to support your decision-making in relation to the diagnosis of upper limb disorders in adults. It is intended to be used in the *initial* consultation for musculoskeletal problems which are *chronic* in nature and not due to referred pain from, e.g. Angina or Oesophagitis. Appendix A lists the disorders included in the DSAID-ULD.

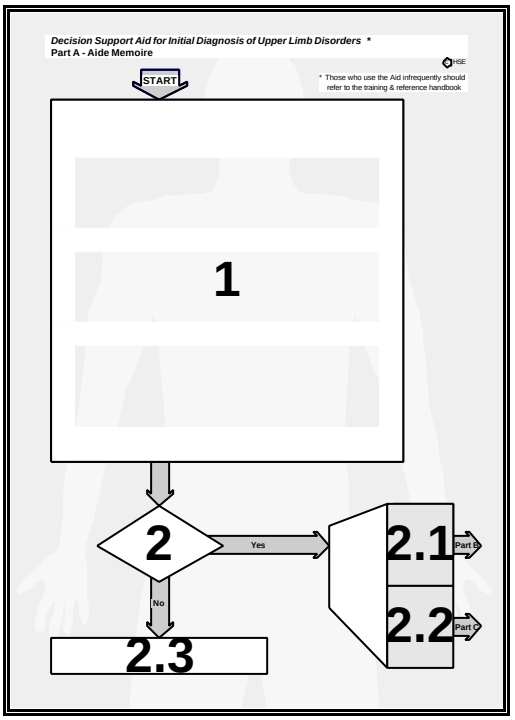
The DSAID-ULD is in five parts. Part A consists of an Aide Memoire which provides a list which covers key elements of a patient history. Parts B and C are both Diagnostic Decision Aids, each consisting of a flowchart which has been designed specifically for helping the physician to assess symptoms of pain in the hand/wrist/forearm and elbow/shoulder/neck respectively. Both parts contain diagnostic criteria which need to be identified from the patient's symptoms and signs, and each provides a structured approach for making an initial diagnosis.

Parts D and E are tables containing supplementary information as regards confirmatory symptoms, signs and associated apparent risk factors. These should be referred to if the doctor feels he or she has not obtained enough information after following parts A, B, and C of the Aid to make a satisfactory diagnosis.

The user of the DSAID-ULD should begin the medical assessment by following the steps in Part A, the Aide Memoire. An overview of these steps is provided below.

Part A - Aide Memoire

The following steps cover key areas of the medical assessment. Step numbers are indicated on the figure below.



PART A

Step 1 Collect all information that you would normally need for completing an initial differential diagnosis. A list of key elements of the patient history is provided to be used as a memory aid, if you wish.

Step 2 Consider whether symptoms include musculoskeletal pain in upper limb, checking that this pain is not referred from e.g. Angina or Oesophagitis.

2.1 If symptoms include musculoskeletal pain in hand/wrist/forearm proceed to Part B.

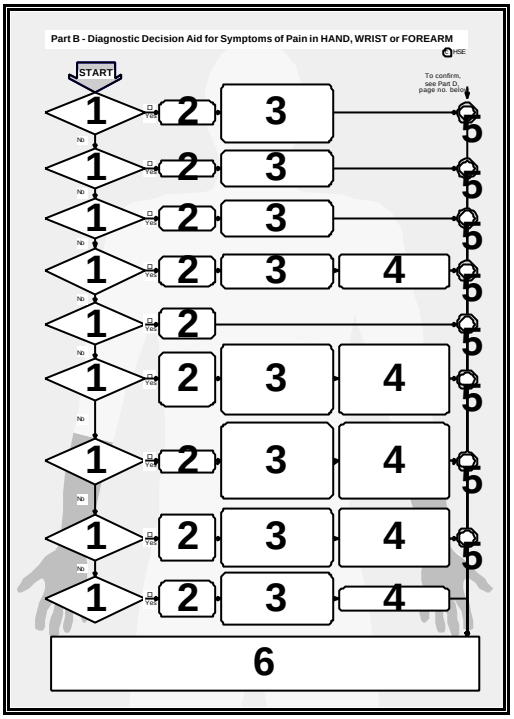
2.2 If symptoms include musculoskeletal pain in elbow/shoulder/neck proceed to part C.

2.3 If symptoms do not include musculoskeletal pain in upper limb, continue with your normal diagnostic procedures.

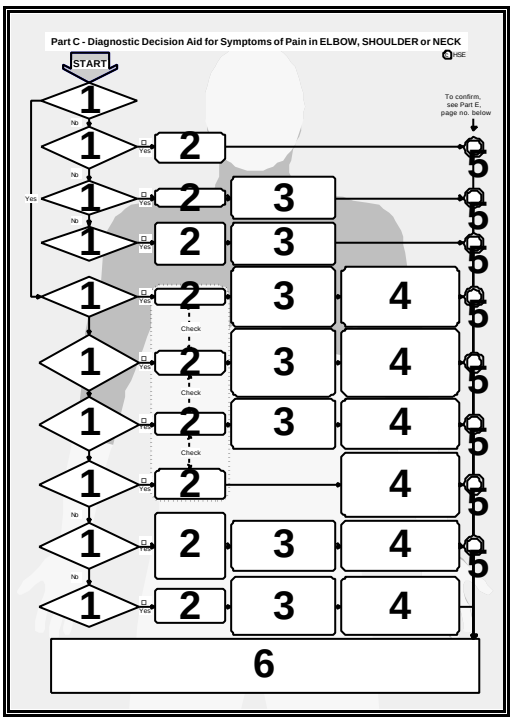
Parts B & C - Diagnostic Decision Aids

The following steps provide a structured approach for using Parts B and C of the Aid. Step numbers are indicated on the figures below.

PART B



PART C



Step 1 Identify possible syndrome by process of elimination. This will involve proceeding through the YES/NO decisions, using the information obtained in the patient history and physical examination. These decisions will direct you to one of the following diagnosis options in column 2 of the Aid:

Part B (Hand, Wrist or Forearm)	Part C (Elbow, Shoulder or Neck)
• Raynaud's Syndrome • Ganglion • Dupuytren's Contracture • Trigger Finger • Arthritis • Carpal Tunnel Syndrome • De Quervain's Disease • Tenosynovitis • Non-specific diffuse forearm pain	• Arthritis of Elbow • Olecranon Bursitis • Epicondylitis • Bicipital Tendonitis • Rotator Cuff Tendonitis • Shoulder Capsulitis • Osteo-Arthritis of Acromioclavicular Joint • Cervical Spondylosis • Diffuse shoulder or neck pain

These diagnosis options and their associated decisions are ordered to enable the process of elimination to begin with more specific disorders and move towards broader categories which pose greater diagnostic difficulty such as "*diffuse pain*". Appendix A lists these diagnosis options and the conditions they encompass.

Step 2 List or mark possible options for diagnosis in column 2. Check for other possible options, if the Aid indicates to do so (see, for example, "*Check for*" prompts in column 2 diagnosis boxes for Carpal Tunnel Syndrome, Tenosynovitis, and Cervical Spondylosis; or "*Check*" arrows between shoulder diagnosis boxes in column 2).

Step 3 Find out whether the patient's background history involves activities (work or leisure) which include those listed in column 3 for the identified syndrome, to help assess whether the patient's complaint is likely to be related to and/or exacerbated by activities.

Step 4 For less obvious syndromes, carry out physical examination using criteria provided to confirm or clarify diagnosis.

Step 5 If you feel more information is needed to confirm diagnosis, refer to Part D or E on page number indicated in column 5.

Step 6 Initiate management of complaint, referring to highlighted options.

Parts D & E - Tables of Supplementary Information for confirming diagnosis

The tables in Part D list confirmatory symptoms and signs, and associated apparent risk factors[3] for disorders of the hand, wrist and forearm. Similarly, for the elbow, shoulder and neck, the tables in Part E list symptoms and signs for confirmation as well as apparent risk factors.

Disorders are listed in alphabetical order. The page numbers indicated in column 5 of Parts B and C will lead you to the appropriate tables in Parts D and E, respectively. You should refer to these tables if you do not have enough information to make a satisfactory diagnosis after following Parts A, B and C of the Aid.

The above processes will now be demonstrated through the presentation of a short example and two brief exercises to allow you to practise applying the DSAID-ULD.

2.2 Applying the DSAID-ULD: Examples

On first appearances, the DSAID-ULD may seem complex, but as you will find out, it is relatively straightforward to use. In the following text you will see three examples to demonstrate how the DSAID-ULD can be applied to obtain a diagnosis from a patient history. These are outlined below.

1 The first will consist of a worked example.
2 The next example will take the form of an interactive step-by-step exercise.
3 For the final example, you will be expected to perform the same task in a less interactive exercise.

[3] The phrase 'apparent risk factor' is used because some of the factors provided by the aid have not been proved by epidemiological studies. However, operationally there is a need to provide some guidance on activities or actions which could cause and/or exacerbate the conditions in the Aid. This is particularly important in relation to management of a disorder, where control of exposure to such actions could form part of a management strategy.

Case History 1 *(worked example)*

While reading this section you should continue to refer to the DSAID-ULD provided in Unit 2. The following example illustrates how the Aid should be used to diagnose an Upper Limb Disorder.

1) You are presented with a patient complaining of pain in the third finger of their right hand. You would gather information about the presenting symptoms, patient background, and conduct a general systems review, referring to the prompts given on **Part A** of the Aid (the aide memoire), if needed. From the initial questioning you obtain the following information:

Presenting symptoms	
Volunteered by patient:	Pain in the third finger of my right hand
When the patient is asked for more detail:	Specifically, pain at base of finger, at site of palmar crease Loss of movement '**Locks' in flexion, then triggers as I extend it**
How long:	3 months
Radiation:	along tendon sheath into palm
Character & Severity:	dull ache **severe when it 'catches'**
Duration/ Frequency/ Periodicity:	intermittent
Special Times of Occurrence & Aggravation:	worse early in morning
Relief:	nil
Associated features:	**stiffness** **locks in flexion**
Other Sites:	no
Patient Background	
Past History/Family History:	nil of note
Drugs/Allergies:	nil
Work Activity:	**Mechanic**
Household Activity:	nil of note
Leisure Activity:	nil of note
General Systems Review	
	nil of note

2) You will have noted that symptoms include musculoskeletal pain in the hand which would lead you to **Part B** of the DSAID-ULD '*Diagnostic Decision Aid for Symptoms of Pain in Hand, Wrist or Forearm*'.

N.B. It is assumed that you will have collected all information that you would normally need for completing an initial differential diagnosis BEFORE proceeding to Part B or C of the Aid.

3) You would now identify the syndrome through a process of elimination. This would involve proceeding through the **YES/NO decision boxes** in **Part B** of the Aid, while referring to the information you have obtained on the patient's symptoms, and asking the patient additional questions if needed.

4) Having eliminated boxes one to three in the **first column** of **Part B** of the Aid, you would find that a number of the presenting symptoms obtained (highlighted in **bold** font in patient history) match the contents of the **fourth box** in that column i.e. *stiffness* AND *triggering/locking in finger* AND *pain in finger from movement*. This would lead you to conclude that the syndrome could be *Trigger Finger / Stenosing Tenosynovitis*.

5) Assuming you had decided that you were dealing with Trigger Finger, you would proceed to the **next box (column 3)** of **Part B** and notice that the disorder could be action related if the patient's activities involve *mechanical pressure on the palmar side of the fingers*. Since the patient works as a mechanic it would be reasonable to expect that their work involves the use of a variety of tools. Assuming this was the case, your questioning could examine whether the use of tools results in pressure on the fingers. In this way, you could make a reasonable judgement on whether work may have contributed to and/or exacerbated the problem.

6) In order to confirm your diagnosis you would undertake a physical examination, to check for the signs contained in the appropriate box in the **next column (column 4)** of **Part B**, i.e. *palpable nodule in palm at base of digit*.

7) If these tests were not conclusive then you should consult the table in **Part D** (page **D-5**) of the Aid which provides a more comprehensive list of confirmatory signs for Trigger Finger.
At this stage you might also feel you need more information on action-related apparent risk factors than was provided in **column 3** of **Part B**. From reference to the appropriate table on page **D-5** you will see that another apparent risk factor is *use of tool or control handles with hard or sharp edges*. You would ask more questions about work or leisure activities in order to investigate this further.

N.B. You should always remember that you can consult the appropriate table in Part D or E which show apparent risk factors for the disorders contained in the Aid. This might provide you with information which is vital for assessing the action-relatedness of the presenting condition.

8) You are now in a position to compile a list of possible management options referring to the prompts listed at the **bottom** of **Part B** of the Aid, if needed.

Case History 2 *(step-by-step exercise)*

You should continue to refer to the DSAID-ULD in order to work through the following example. The answers which would be expected from following the Aid are given under each question.

For each question, please give your answer by writing in the space provided, then read fully the answer we have provided before proceeding to the next question.

Imagine you are presented with the following information in consultation with a patient:

Presenting symptoms	
Volunteered by patient:	Pain in my right shoulder
When the patient is asked for more detail:	Pain specific to anterior deltoid area
How long:	3 months
Radiation:	down arm along biceps
Character & Severity:	dull worse on raising arm forward
Duration/ Frequency/ Periodicity:	most of the time
Special Times of Occurrence & Aggravation:	lifting arms above head
Relief:	rest
Associated features:	tender, bicipital groove
Other Sites:	no
Patient Background	
Past History/Family History:	nil of note
Drugs/Allergies:	nil
Work Activity:	nil of note
Household Activity:	Has just finished painting house
Leisure Activity:	Used to play tennis
General Systems Review	
	nil of note

1) Referring to the DSAID-ULD, use the above information to decide upon an initial diagnosis.

_____

_____

Answer:

You should have noted that symptoms include musculoskeletal pain in the shoulder which leads you to **Part C** of the diagnostic aid ,*Diagnostic Decision Aid for Symptoms of Pain in the Elbow, Shoulder or Neck.*

You would now identify the syndrome through a process of elimination. This would involve proceeding through the **YES/NO decision boxes**, while referring to the patient history information which was presented. You should have concluded that *pain in the anterior region*' (of the shoulder) matched the criteria in the **third box of column 1** and been directed into the *Bicipital Tendonitis* box.

2) On reaching your diagnosis, you will notice that the DSAID-ULD asks you to cross-check with other shoulder disorders. From the information we have provided on the patient history, is there anything to suggest possible alternatives to your diagnosis?

Answer:

From the questions in **column 1** of **Part C**, there does not appear to be any indication that the presenting complaint could be attributed to other shoulder problems - i.e.:
- *pain* is not specifically described *in the midrange of shoulder abduction* (Rotator Cuff Tendonitis),
- there is no evidence of *global restriction of shoulder movement* (Shoulder Capsulitis), and
- *tenderness over the acromio-clavicular joint*s not described (Osteo-arthritis).

Therefore *Bicipital Tendonitis* appears to be the most likely option for diagnosis.

3) Assuming you had decided that you were dealing with Bicipital Tendonitis, what sort of questions would you ask to investigate whether causation of the condition could be action-related?

Answer:

At this point you should have proceeded to the next box (**column 3**) of **Part C** and noticed that the disorder could be action related if a patient's activities include, among other things *prolonged/ forceful elevation/ abduction of the arm at the shoulder*, *repeated/prolonged over shoulder actions extreme positions of the hands/arms* Since playing tennis and painting could involve at least one of these actions you would note that the disorder might be action related. In a consultation you would ask directed questions about these activities in order to investigate this further. You may have consulted the table in **Part E** (**page E-1**) of the aid for additional information on apparent risk factors in relation to Bicipital Tendonitis.

4) What further steps would you take to confirm your diagnosis?

Answer:

You should have referred at this stage to the **next box** (**column 4**) on **Part C** of the aid. This prompts you to confirm the diagnosis by examining for *pain or discomfort on active forward flexion of the upper arm*, which you should notice, is consistent with the patient information given. If you felt that this was not conclusive then you should proceed once again to **Part E** (page **E-1**) of the aid which provides a more complete list of tests and physical signs to be used in confirmation for Bicipital Tendonitis.

5) You would now be in a position to compile a list of possible management options. Briefly suggest some of these below.

Answer:

Whatever your answer, you could have referred to the **management options** which are listed at the **bottom** of **Part C** of the aid. These serve as an aide memoire, to provide general prompts if you need them.

Case History 3 *(exercise)*

In this final example, you are expected to work through the entire DSAID-ULD to decide upon a diagnosis, examine possible apparent risk factors, and suggest appropriate management options. You should write your answers in the space provided at the bottom of the page. The answers which would be expected from following the Aid are provided in a discussion format on the next page.

Imagine you are presented with the following information in consultation with a patient:

History of symptoms	
Volunteered by patient:	Pain in my arm/wrist (points generally to lower forearm)
When the patient is asked for more detail:	entire forearm affected, on both sides weakness of hand/grip
How long:	3 months, gradual onset, gradually getting worse
Radiation:	pain goes into hand, but not into fingers
Character & Severity:	sharp pain sometimes, aches sometimes severe pain
Duration/ Frequency/ Periodicity:	worse in week / less in weekend
Special Times of Occurrence & Aggravation:	none specific but general movements worsen symptoms
Relief:	none
Associated features:	tiredness, fatigue, malaise burning sensation in hand/fingers often swollen
Other Sites:	nil
Patient Background	
Past History/Family History:	nil of note
Drugs/Allergies:	nil
Work Activity:	counting and sorting stationery supplies Mon-Fri, 9-5, still working (involves forceful and repetitive grasping & wrist bending)
Household Activity:	nothing extreme or unusual
Leisure Activity:	cycling (to work, and once or twice at the weekend)
General Systems Review	
	nil of note

Based on the above patient information:

1) What diagnostic option(s) would you initially consider? _____

_____

2) What evidence is there that the condition might be action-related? _____

_____

3) How would you manage the condition? _____

_____

Case History 3 *(discussion of answers)*

1) You should have noted that symptoms include musculoskeletal pain in the wrist and forearm which leads you to **Part B** of the DSAID-ULD '*Diagnostic Decision Aid for Symptoms of Pain in Hand, Wrist or Forearm*'.

You would now attempt to identify the syndrome through a process of elimination. This would involve proceeding through the **YES/NO decision boxes**, while referring to the patient information which was presented. This could give rise to a number of diagnostic options:

- ***Arthritis***, due to the presence of *swelling*, particularly if this is localised to a joint, and the burning sensation which could be perceived as *local heat*;
- ***Carpal Tunnel Syndrome***, as the burning sensation presented might be considered to be *paresthesia in the fingers*;
- ***Tenosynovitis***, due to the patient presenting *wrist pain on movement*; or
- ***Non-specific diffuse forearm pain***.

The latter option should be considered when it is not possible to pinpoint indicators of a specific syndrome, since non-specific pain is far more common than precise pain. In a study by Harrington et al. (1998) it was acknowledged by a group of experts in the field of Upper Limb Disorders that although non-specific diffuse forearm pain is not associated with any specific anatomical structure, it may well be a real entity, and is certainly associated with considerable morbidity. Therefore it would be reasonable to conclude that diffuse forearm pain is no different in principle from characterising low back pain or headache as clinical entities. Since it is not always appropriate to give symptoms a precise label, a non-specific diagnosis option is given at the bottom of **Part B** (as above) and **Part C** (*Diffuse shoulder or neck pain*).

As the Aid is designed to be used for initial medical assessments, it would be acceptable to conclude the diagnosis with a list of options taken from those above. Check-boxes are provided on the Aid to simplify note-taking, for when you are considering at least two diagnostic options in parallel.

Alternatively, you may have decided that you would record *non-specific diffuse forearm pain* as your diagnosis, since the patient history does not precisely match the descriptions given on the Aid for the other syndromes, i.e.:

- there is no evidence of *early morning stiffness* (Arthritis),
- *sensory loss in the fingers* is not described (Carpal Tunnel Syndrome)
- the pain described is not particularly *localised to tendons or sheaths* (Tenosynovitis)

Although at this stage it appears that *non-specific diffuse forearm pain* could be the most appropriate diagnosis, we will continue to consider the other options in parallel for the purposes of the exercise.

2) The next stage would be to proceed to the **next box** (**column 3**) of **Part B**, to consider whether the condition could be action-related. Please note that for *Arthritis*, no such box is given, as no specific actions are known to be associated with this condition. However, for the other diagnostic options (*Carpal Tunnel Syndrome*, *Tenosynovitis* and *Non-specific diffuse forearm pain*), it appears that the disorder could be action related, since the patient's work activities include a combination of *forceful and repetitive hand and wrist actions*. You could also consult the tables in **Part D** of the Aid for additional information on apparent risk factors in relation to the above disorders.

3) In order to confirm your diagnosis you would refer to the information collected in your physical examination, and conduct more tests as needed, to check for the

signs contained in the appropriate box in the **next column (column 4)** of **Part B**. No such box is provided for *Arthritis*, since it is expected that in most cases, the information provided will be enough to complete the diagnosis. In the case of *non-specific diffuse forearm pain*, confirmation might be obtained by referral of the patient to a specialist.

If you were still considering *Arthritis*, *Carpal Tunnel Syndrome* and *Tenosynovitis*, having been unable to reach a conclusion about the diagnosis, then you should proceed once again to **Part D** of the Aid which provides a more comprehensive list of confirmatory signs.

> In a consultation you would now be in a position to compile a list of possible management options, referring to the prompts given at the **bottom** of **Part B** of the Aid, if needed.

That is the end of the exercises. Now that you have completed them, you should be in a position to apply the Aid in working consultations. While we trust that you will find the Aid easy to use, you should contact us at the number below if you have any problems.

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3. Technical support

Should there be any difficulties using the materials, or questions about the pack, the researchers will be happy to assist. They can be contacted at the venue below, Mondays to Fridays, between 9am and 5pm.

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4. Reference

Harrington, J. M., Carter, J. T., Birrell, D., and Gompertz, D. (1998). Surveillance Case Definitions for Work Related Upper Limb Pain Syndromes. *Occupational and Environmental Medicine*, *55*, 264-271.

Appendix A Diagnosis options covered by Aid and alternative labels

The following tables list the conditions as they are named on the Aid. Alternative diagnostic labels sometimes used are also given.

Diagnosis option	Alternative labels
1. Raynaud's Syndrome	Raynaud's Phenomenon, Hand-Arm Vibration Syndrome, Vibration White Finger
2. Ganglion	
3. Dupuytren's Contracture	
4. Trigger Finger	Stenosing Tenosynovitis
5. Osteo-Arthritis	
6. Rheumatoid-Arthritis	
7. Carpal Tunnel Syndrome	
8. De Quervain's Disease	De Quervain's Tenosynovitis, De Quervain's Tenovaginitis
9. Tenosynovitis	Tendinitis, Peritendinitis, Tenovaginitis
10. Non-specific diffuse forearm pain	"Impossible to make specific diagnosis"

Table A1 List of diagnosis options for hand, wrist and forearm

Diagnosis option	Alternative labels
1. Arthritis of Elbow	
2. Olecranon Bursitis	
3. Lateral Epicondylitis	Tennis Elbow
4. Medial Epicondylitis	Golfer's Elbow
5. Bicipital Tendonitis	Humeral Tendinitis, Bicipital Tenosynovitis
6. Rotator Cuff Tendonitis	Supraspinatus Tendonitis, Infraspinatus Tendonitis, Teres Minor Tendonitis, Subscapularis Tendonitis, Rotator Cuff Tear, Subdeltoid Bursitis, Subacromial Bursitis
7. Shoulder Capsulitis	Frozen Shoulder, Adhesive Capsulitis
8. Osteo-Arthritis of Acromioclavicular Joint	Acromioclavicular Syndrome
9. Cervical Spondylosis	Osteo-arthritis of the neck, Cervical Syndrome, Radiculopathy, Cervical Spondylarthrosis, Cervical Root Syndrome
10. Diffuse shoulder or neck pain	Tension Neck Syndrome, Cervicobrachial Syndrome, "Impossible to make specific diagnosis"

Table A2 List of diagnosis options for elbow, shoulder and neck

Appendix B Literature sources of criteria used in Aid

The following tables list the sources of information used in deriving the diagnostic criteria provided by the Aid, as well as the apparent physical risk factors given. The full reference list is shown after the tables.

Diagnosis option	Diagnostic criteria	Apparent physical risk factors
Raynaud's Syndrome	Cherniack (1990), Hamilton (1990), Putz-Anderson (1988), Boveni (1986)	Cherniack (1990), Hamilton (1990), Putz-Anderson (1988), Boveni (1986)
Ganglion	Helliwell (1996), Putz-Anderson (1988), Viikari-Juntura (1983), McRae (1976), De Orsay et al. (1937)	De Orsay et al. (1937)
Dupuytren's Contracture	Helliwell (1996), Hamilton (1990), McRae (1976)	Helliwell (1996), Hamilton (1990), McRae (1976)
Trigger Finger	Helliwell (1996), Fine and Silverstein (1995), Putz-Anderson (1988), Quinnell (1980), McRae (1976)	Putz-Anderson (1988), Quinnell (1980)
Osteo-Arthritis	Helliwell (1996), Kuorinka and Forcier (1995), Hamilton (1990), Viikari-Juntura (1983), McRae (1976)	Kuorinka and Forcier (1995), Hamilton (1990), McRae (1976)
Rheumatoid-Arthritis	Smyth (1992), McRae (1976), Allander (1970)	
Carpal Tunnel Syndrome	Harrington (1998), Helliwell (1996), Putz-Anderson (1988), Viikari-Juntura (1983), Fine and Silverstein (1995), Kuorinka and Forcier (1995), Munro and Edwards (1995), Buch-Jaeger and Foucher (1994), Stetson et al. (1993), Franklin et al. (1991), Katz et al. (1991), Vessey et al. (1990), Mesgarzadeh et al. (1989), Schenck (1989), Corwin (1987), McCracken (1986), Wood and Dobyns (1986), McRae (1976), Phalen (1966)	Helliwell (1996), Putz-Anderson (1988), Kuorinka and Forcier (1995), Stetson et al. (1993), Franklin et al. (1991), Katz et al. (1991), Vessey et al. (1990), Mesgarzadeh et al. (1989), Schenck (1989), McCracken (1986), Wood and Dobyns (1986)
De Quervain's Disease	Harrington (1998), Helliwell (1996), Fine and Silverstein (1995), Munro and Edwards (1995), Ranney (1993), Putz-Anderson (1988), Wood and Dobyns (1986), McRae (1976), Younghusband and Black (1963)	Helliwell (1996), Putz-Anderson (1988), Wood and Dobyns (1986), McRae (1976)
Tenosynovitis	Harrington (1998), Helliwell (1996), Fine and Silverstein (1995), Kuorinka and Forcier (1995), Kurppa et al. (1991), Cherniack (1990), Hamilton (1990), Putz-Anderson (1988), Wood and Dobyns (1986), Viikari-Juntura (1983), Stuckey et al. (1982), Waris et al. (1979), McRae (1976), Thompson (1951), Hammer (1934)	Kuorinka and Forcier (1995), Kurppa et al. (1991), Hamilton (1990), Putz-Anderson (1988), Wood and Dobyns (1986), Stuckey et al. (1982), McRae (1976),Thompson (1951), Hammer (1934)
Non-specific diffuse forearm pain	Harrington (1998)	

Table B1 Sources of criteria for hand, wrist and forearm

Diagnosis option	Diagnostic criteria	Apparent physical risk factors
Arthritis of Elbow	McRae (1976)	McRae (1976)
Olecranon Bursitis	Fine and Silverstein (1995), Viikari-Juntura (1983), McRae (1976), Murley (1975)	McRae (1976), Murley (1975)
Lateral Epicondylitis	Harrington (1998), Helliwell (1996), Fine and Silverstein (1995), Kuorinka and Forcier (1995), Chard and Hazleman (1991), Putz-Anderson (1988), Viikari-Juntura (1983), Farr (1982), Stuckey (1982), Luopajarvi et al. (1979), Waris et al. (1979), McRae (1976), Murley (1975), Boyd and McLeod (1973)	Kuorinka and Forcier (1995), Putz-Anderson (1988), Farr (1982), Stuckey (1982), Luopajarvi et al. (1979), McRae (1976), Murley (1975), Boyd and McLeod (1973)
Medial Epicondylitis	Harrington (1998), Helliwell (1996), Fine and Silverstein (1995), Putz-Anderson (1988), Viikari-Juntura (1983), Stuckey (1982), Waris et al. (1979), McRae (1976), Luopajarvi et al. (1979), Murley (1975)	Putz-Anderson (1988), Stuckey (1982), Luopajarvi et al. (1979), Murley (1975)
Bicipital Tendonitis	Helliwell (1996), Fine and Silverstein (1995), Kuorinka and Forcier (1995), Munro and Edwards (1995), Putz-Anderson (1988), Rowe (1987), Nevasier (1983), Viikari-Juntura (1983), Waris et al. (1979)	Kuorinka and Forcier (1995), Putz-Anderson (1988), Rowe (1987), Nevasier (1983)
Rotator Cuff Tendonitis	Harrington (1998), Helliwell (1996), Fine and Silverstein (1995), Kuorinka and Forcier (1995), Uhtoff (1990), Putz-Anderson (1988), Zlatkin (1988), Hagberg and Wegman (1987), Rowe (1987), Nevasier (1983), Viikari-Juntura (1983), Waris et al. (1979), McRae (1976)	Kuorinka and Forcier (1995), Uhtoff (1990), Putz-Anderson (1988), Hagberg and Wegman (1987), Rowe (1987), McRae (1976)
Shoulder Capsulitis	Harrington (1998), Helliwell (1996), Kuorinka and Forcier (1995), Uhtoff (1990), Putz-Anderson (1988), Nevasier (1983), Viikari-Juntura (1983), Waris et al. (1979), McRae (1976)	Kuorinka and Forcier (1995), Uhtoff (1990), Putz-Anderson (1988), Nevasier (1983), McRae (1976)
Osteo-Arthritis of Acromioclavicular Joint	Fine and Silverstein (1995), Munro and Edwards (1995), Nevasier (1983), Viikari-Juntura (1983), Waris et al. (1979), McRae (1976)	Nevasier (1983)
Cervical Spondylosis	Helliwell (1996), Fine and Silverstein (1995), Kuorinka and Forcier (1995), Hagberg and Wegman (1987), Viikari-Juntura (1983), Waris et al. (1979), McRae (1976)	Kuorinka and Forcier (1995), Hagberg and Wegman (1987), Waris et al. (1979), McRae (1976)
Diffuse shoulder or neck pain	Harrington (1998)	

Table B2 Sources of criteria for elbow, shoulder and neck

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