# SIMRAC

## Health 803: Final Report

Final Report of Health 803 :
Development and evaluation of guidelines and materials for the technology transfer of x-ray reading skills to medical practitioners in the mining industry.

25 September 2002.
(Revised 18 December 2002)

Professor Neil White
Occupational Medicine Clinical Research Unit
UCT Lung Institute
PO Box 34560
Groote Schuur 7937.

nwhite@uctgsh1.uct.ac.za
Tel: 021 – 4066850
Fax: 021 – 4066851

# Synopsis.

Health 803 was a project concerned with the development of self-directed, interactive distance learning materials for health practitioners who are concerned with Radiological Occupation Lung Disease Surveillance (ROLDS) in the South African mining industry. Augmentation of proficiency in ROLDS is essential to the implementation of forthcoming regulations concerned with this matter in terms of the Mine Health and Safety Act. The project has developed a CD-Rom based interactive program with visual and audio components including a simulation of ROLDS. This product is available to health practitioners to earn CPD accreditation. Although mainly concerned with radiology of gold and coal miners, this program will be further developed to include asbestos related diseases. Further developments will facilitate the use of, and broaden the scope of this interactive product. The CD-Rom is available through SIMRAC for heath practitioners performing ROLDS in the South African mining industry. It is highly recommended for current surveillance readers in the industry as a means of earning ROLDS CPD points and will be particularly appreciated by newcomers to the field. Outside of the mining industry, this product will be distributed by UCT Lung Institute, Occupational Medical Clinical Research Unit (Professor White).

# Contents

# 1. Executive Summary of Health 803.

Health 803 was a SIMRAC project concerned with radiological occupational lung disease surveillance (ROLDS) occurring amongst people employed in the South African mining industry.

1.1 In Health 803 we established demographic and professional details of people currently providing screening radiology services in the SA mining industry, as detailed in the protocol in section 3 (Study A).

1.2 In Health 803 we have set out to make a permanent difference to professional standards of competence for radiological medical surveillance through:

- 1.2.1 Development of a curriculum outlining the knowledge base for radiological surveillance. The curriculum is detailed in section 5.
- 1.2.2 Development of training methods and materials that cover the curriculum. The materials are considered to be appropriate, affordable and accessible. In particular the materials take into account the need for distance learning. The development process of the materials for training is detailed in section 6. The materials are contained on the CD-Rom. ROLDS Training and Simulation. Version 1.0
- 1.2.3 Development of an appropriate test of competence to perform ROLDS surveillance as detailed in section 6 and analysed in Section 7.
- 1.2.4 Evaluation of training methods and materials in relation to performance in the test of competence as detailed in 7. The ROLDS Simulation programme demonstrates a wide range of levels of agreement between ROLDS practitioners and expert interpretation of films.

1.3 The training products developed in Health 803 are available for distribution more widely in the SA mining industry. A Memorandum of Agreement for the publication and distribution of this CD-Rom will be drawn up between the Mine Health and Safety Council and the UCT Lung Institute Occupational Medicine Clinical Research Unit / Professor Neil White.

# 2. Scope and Definitions.

For the purposes of this project the Faculty for Health 803 have accepted the following definitions and scope of ROLDS:

2.1 Screening is defined as the presumptive identification of unrecognised disease or defect by the application of a rapidly applied test. A screening test is not intended to be diagnostic. Persons with positive or suspicious findings are referred for diagnostic evaluation and necessary treatment.

2.2 Radiological Occupational Lung Disease Surveillance (ROLDS) is a screening activity. Surveillance refers to any programme for medical surveillance carried out in South Africa as a result of risk assessment or because it is required in terms of the Mine Health and Safety Act (or the Occupational Health and Safety Act).

2.3 The purpose of such a programme of ROLD Surveillance is:

2.3.1 to detect and appropriately refer occupational lung disease at the earliest possible stage;
2.3.2 to establish a base line against which subsequent changes in health status of employees can be evaluated;
2.3.3 to identify other medical conditions incidentally detected that require further referral for appropriate evaluation and treatment of conditions identified;
2.3.4 to provide information concerning the prevalence or incidence of abnormalities that will enable the employer to eliminate, control and minimise the health risk for which the programme is being conducted.

2.4 The occupational lung diseases for which a programme of radiological surveillance is warranted are:

1) Pulmonary tuberculosis (TB).
2) Pneumoconiosis (Pn), including silicosis, silico-tuberculosis, coal workers' pneumoconiosis (CWP) and asbestosis.
3) Benign asbestos-related pleural disorders.

Screening radiology has not been shown to be effective in the early detection of other occupational lung diseases. However these conditions, which include lung cancer, mesotheliomia and chronic obstructive pulmonary disease (COPD) do cause recognisable abnormalities on the chest x-ray. Non-occupational abnormalities will regularly be detected incidentally by radiological surveillance programmes. Such abnormalities need to be distinguished from occupational conditions and appropriately referred.

# 3. Acknowledgements.

3.1 The primary faculty for Health 803 and development of training materials ("The Symposium) comprised Prof. N. White (UCT Lung Instutute) (Pulmonologist and project leader), Prof. A. Solomon (National Centre for Occupational Health), Prof. R. Glynn-Thomas (Dept of Radiology, Witwatersrand University), Prof. H. Goodman (Dept of Radiology, U.C.T.), Dr K. Mashao (Consultant Radiologist), Dr. J. Murray (Pathologist) (National Centre for Occupational Health), Ms E LeRoux (Harmony Gold Mining)(Radiographer) and Dr L. Ndelu (Director, M.B.O.D.).
3.2 Mr S. Bredenkamp of Information Action cc developed the software for the ROLDS CD-Rom and its administration.
3.3 Prof. S Benningfield (Dept of Radiology, U.C.T.) assisted the project with enabling shareware software, hardware and advice.
3.4 Prof M. Ross (SIMRAC) has contributed to this project with enabling advice, beginning from the earliest stages in its conception.
3.5 Dr G. Churchyard (Aurum Health Research) and Dr R. Naidoo (Nelson Mandela Health Sciences Faculty) assisted this project through use of libraries of research radiographs from their original investigations of South African miners.
3.6 Mrs P. Rabie was engaged to perform the telephonic survey detailed in Study A.
3.7 Mr M. Jaffer, OnScreen Inc., provided digital sound recording and editing services.
3.8 Additional consultations have been with Prof JP van Niekerk, Mr M. Wyeth and Mr P. Herselman.
3.9 UCT Conference Management Services assisted in the organisation of the Fourways Symposium, February 2002, and CPD points accreditation.
3.10 An early version of the ROLDS CD-Rom was presented at the 2002 meeting of the Mine Medical Officers' Association.

Special thanks go to the medical practitioners who agreed to participate in Health 803 and to be randomised for the evaluation of the CD-ROM: ROLDS Training and Simulation. Their willingness to participate and give of their time is warmly appreciated and the project could not have progressed without this willingness. For those who were willing, but ultimately unable to do so through time and other constraints – there will be other opportunities.

# 4. Protocol : A survey of current categories and training of practitioners performing Radiological Occupational Lung Disease Surveillance in the SA Mining Industry.

**Summary** : A telephonic survey to establish the demographic and training characteristics of contactable practitioners currently performing ROLDS in the SA mining industry.

**Rationale** : Regulations in terms of the Mine Health and Safety Act requiring ROLDS of employees exposed to significant risk from silica, coal and asbestos dust are imminent. These regulations require that such surveillance is conducted by competent persons. Such radiological surveillance has in any case already been going on for many years in the SA mining industry. Additionally there is a long history of using radiological surveillance as an essential part of active case finding for pulmonary tuberculosis using MMR.

ROLDS is the responsibility of the occupational medical practitioner engaged by the manager of a mine. The task of primary reading of x-rays is then often delegated. Since there is no formal certification of competence to perform such tasks the delegation of this responsibility is not uniform. Best current practice is usually considered to have this task delegated to a medical practitioner. However, this is by no means solely the case and at the present time primary reading is also being performed by nurses and radiographers.

This survey sets out to establish the demographic and training characteristics of all contactable practitioners currently performing radiological medical surveillance in the SA mining industry. This information will be of value for regulators and planners for occupational health in the industry.

For the purposes of Health 803 this survey will serve the following functions.
1. It will make the relevant professionals aware of the existence of Health 803.
2. It will provide a sampling frame for the methods and proposed test of competence aspects of Health 803.

**Study design** : A cross-sectional study of contactable persons performing ROLDS in the mining industry in the months July / August 2001.

**Study methods** : Commencing with a list of 20 mine medical officers with a declared interest in this project and consulting with the primary faculty and project consultants, an experienced radiographer made telephonic contact and administered a structured questionnaire to each respondent.

**Respondents are defined as:** any registered health professional who is responsible for primary reading, diagnostic reading or takes administrative responsibility for radiological surveillance for pneumoconiosis or tuberculosis in the SA mining industry (i.e. surveillance in any activity covered by the Mine Health and Safety Act).

**Questionnaire:** the following information was ascertained during the interview:

1. Surname
2. Christian name or initials
3. Title (Prof, Dr, Mr, Mrs, Ms, Miss) and gender.
4. Postal address, including postal code.
5. Telephonic number at which the person was contacted.
6. Fax and/or e-mail address
7. Category of radiological surveillance performed for the SA mining industry
    a) primary reader
    b) secondary / specialist / referral reader
    c) administrative responsibility for the surveillance programme
    d) a combination of the above
8. Number of surveillance chest radiographs reviewed per week.
    a) 1-20
    b) 20-50
    c) 50-100
    d) 100-200
    e) 200-500
    f) > 500
9. Approximate proportions of large film : MMR plates reviewed
    a) 100 % large
    b) > 80 % large but < 100 %
    c) > 50 % large but < 80 %
    d) > 20 % large but < 50 %
    e) > 1 % large but < 20 %
    f) 100 % MMR
10. Mining company(s) for which these services are performed. List only the name of the most important company (for numbers of x-rays reviewed). If services are provided to a number of companies, establish the approximate number of companies for which this is done. Establish the mining sector(s) (gold/ coal/ platinum/ diamonds/ base metals/ quarrying/ other) that are serviced.
11. Category of health professional interviewed
    a) medical practitioner
    b) nurse
    c) radiographer
12. Year of first attaining a professionally registerable qualification.
13. In the case of medical practitioners, ascertain post-graduate qualifications (and year)
    a) DOH or equivalent
    b) specialist radiologist
    c) other
    d) none
14. In the case of other categories of health professional ascertain relevant post-qualification training.
    a) in-service
    b) other
    c) none
15. Can the respondent refer the interviewer to other people who might be respondents for this survey?
16. Would the respondent be interested in attending or receiving a continuing medical education programme concerned with radiological medical surveillance? (Yes / No)

17. Would the respondent be willing to perform a self-evaluation exercise? (Yes / No)
18. Does the respondent have access at work or home to a PC with a CD Rom drive?
19. Does the respondent have access to the internet on a computer with a CD Rom drive?

**Data management** : all data was be directly captured in Microsoft Excel. All data will be backed up with both hard drive and disk copies as it is collected.

**Data analysis** : data is descriptive and will be analysed by tabulation and cross-tabulation.

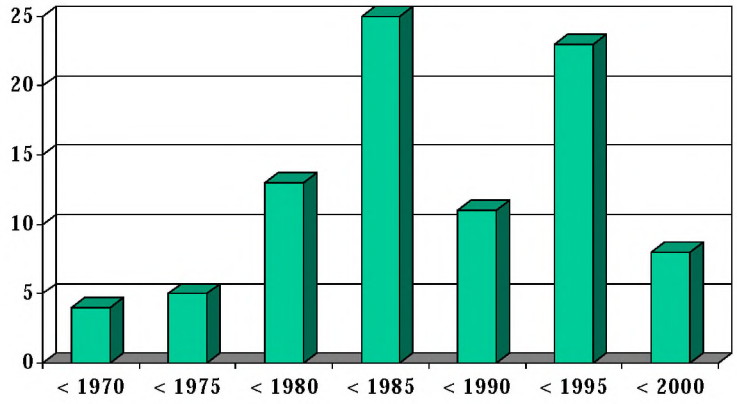
**Project management and personnel** : the interviews were conducted by Mrs Pam Rabie during the months of July and August, 2001.

**Ethics considerations** : this survey is an explicit part of Health 803 which was approved by the UCT Research Ethics Committee on 30 March 2001. (REC Ref 082/2001). Usual considerations with respect to individual and corporate confidentiality and identity were applied. No information that can be linked to any specific individual or corporation is contained in any report relating to this survey. Potential respondents had the obvious right to refuse to participate, if they so wish.

## Results

94 health professionals were identified as performing ROLDS in the SA mining industry in 2001. 66 are males and 28 females. 76 are medical practitioners, 7 are nurses, 5 are radiographers and 6 have other qualifications. Amongst the medical practitioners, 65 have a DOH or higher equivalent, one is a specialist radiologist, one has another postgraduate qualification and 13 have no other relevant post-graduate qualification. Practitioners first graduated over a wide range of years 1964 – 1998 (see figure 3.1).

Figure 3.1: Year of first graduation of 94 ROLDS practitioners in the SA mining industry (2001)



Respondents have high computer access with 91.5% having access to a PC with a CD Rom drive at work or home. 89.4% have internet access but most of the remainder are able to give an have email addresses. Respondents have a very high rate of interest in attending or receiving a continuing medical education programme concerned with radiological surveillance and in performing a self-evaluation exercise (98.9%).

Answers to specific questions of interest were:

Category of ROLDS performed for the SA mining industry

| Category | Number |
|---|---|
| primary reader | 72 |
| secondary / specialist / referral reader | 14 |
| administrative responsibility for the surveillance programme | 5 |
| a combination of the above | 8 |

Number of surveillance chest radiographs reviewed per week

| Radiographs/week | n |
|---|---|
| 1 – 20 | 19 |
| 20 – 50 | 17 |
| 50 – 100 | 13 |
| 100 – 200 | 16 |
| 200 – 500 | 24 |
| > 500 | 4 |

It is estimated that this group of practitioners review in the region of > 400 000 surveillance radiographs / year.

| Approximate proportions of large film : MMR plates reviewed |
|---|

| | |
|---|---|
| • 100 % large | 54 |
| • > 80 % large but < 100 % | 7 |
| • > 50 % large but < 80 % | 7 |
| • > 20 % large but < 50 % | 20 |
| • > 1 % large but < 20 % | 4 |
| • 100 % MMR | 0 |

| Number of mining companies serviced |
|---|

| | |
|---|---|
| 0 | 4 |
| 1 | 50 |
| 2 | 5 |
| 3 | 8 |
| 5 | 1 |
| 6 | 4 |
| 7 | 4 |
| 9 | 2 |
| 10 | 3 |
| 15 | 1 |
| 20 | 1 |
| > 20 | 14 |
| > 100 | 5 |

| Mining sector(s) serviced |
|---|

| | |
|---|---|
| None | 2 |
| Gold | 23 |
| Coal | 19 |
| Platinum | 13 |
| Diamonds | 1 |
| Base metals | 8 |
| Quarrying | 7 |
| More than one | 6 |
| Other | 9 |

## Discussion

The survey has identified ROLDS practitioners in a wide cross-section of the mining industry and, whilst it is not a total survey it does give some indication of the current state of ROLDS practice in the SA mining industry.

The most frequent profile of a ROLDS practitioner is a male medical practitioner with a D.O.H. who has graduated since 1980 and provides ROLDS services for one mine only. This profile is of interest since it confirms that the majority of R.O.L.D.S. practitioners have been trained for this function in as much as D.O.H. programmes cater for training in this specific activity. In most SA D.O.H. programmes such training does not extend beyond 4 – 6 hours of directly related activities.

It is notable that this profile has exceptions. Almost one third of ROLDS practitioners are female and only three quarters are medical practitioners. Only one specialist radiologist was identified and, although other specialist radiologists certainly are involved in ROLDS activities, it is apparent that ROLDS, as practised in SA, is carried out by generalists with additional training and not by specialists.

Respondents identified are responsible for a major portion of radiological surveillance performed in the SA mining industry (est. > 400 000 films per year). Most of the films read appear to be large plates. They cover all sectors of the industry and over a hundred companies when double counting is discounted.

Respondents were seen as being well placed in terms of computer technology to receive the products being developed in Health 803, as well as being receptive to the concept of the product, with a few reservations about self-evaluation.

The survey provided the contact details of medical ROLDS practitioners for the two groups for the study detailed in section 6 below.

# 5. Curriculum for Radiological Occupational Lung Disease Surveillance

**Introduction.**

The scope and purpose of ROLDS was outlined in Section 2. The curriculum of required learning for ROLDS was developed by the Faculty for the programme through an interactive process with Prof. White. This process began with one on one meetings and drafts that were circulated in the Project Manual and commented on by Faculty. This process culminated in a one day meeting of the Faculty members where the curriculum was finalised. At this point detailed planning of the ROLDS Symposium could begin, ensuring that all aspects of curriculum would be covered.

The purpose of training in ROLDS is to equip practitioners with the knowledge and skills required to be an effective reader in a ROLDS programme. For the purposes of this project, and therefore for the curriculum as well, there is an assumption of prior medical training. This curriculum assumes prior learning. This prior learning is part of the undergraduate medical curriculum (M.B.Ch.B./M.B.B.Ch) and includes the anatomy and physiology of the chest and lungs, pathophysiology and management of chest diseases. A post-graduate Diploma in Occupational Health is desirable. This curriculum is therefore intended as a summary of the scope of the required knowledge base for ROLDS, in addition to medical training.

In any screening process, the most important distinction is that between normal and abnormal. The ability to do this accurately, consistently and with high sensitivity is the hallmark of any good screening test. In this instance the screening test being applied is not the x-ray, but the skill of the person reading the x-ray. Measuring the exit outcomes from training to perform surveillance reading must obviously emphasise evaluation of this skill.

An ability to screen out abnormal x-rays with a high sensitivity, accurately identifying tuberculosis and pneumoconiosis cases must not be confused with diagnostic radiology, which is a specialist discipline and has a scope far broader than the training being considered here.

Although the emphasis in this training programme for skills development in ROLDS is for the primary reader of surveillance radiographs to make a confident separation of abnormal x-rays from normal x-rays. This must be followed by appropriate referral for diagnostic evaluation of abnormalities detected, with the most appropriate route for referral (radiologist, medical, TB or compensation services) being decided by the primary reader. Medico-legal and reporting responsibilities were also considered to be a part of the curriculum.

The curriculum set out below provides an outline of the knowledge base for ROLDS. A thorough understanding of the curriculum will provide a useful approach to the challenges posed by practice in the field.

## 5.1 Curriculum.

1. **The technically acceptable chest x-ray.**

- Film quality has an important effect on the sensitivity of the chest x-ray for the detection of pneumoconiosis and other chest pathology. Radiographic technique therefore needs to be rigorous. The reader must know and be able to use criteria to judge and decide on the technical acceptability of PA chest x-rays.

2. **Common defects limiting acceptability of chest x-rays for interpretation.**

- Essential principles of radiography need to be appreciated by practitioners reading chest x-rays if they are to give meaningful advice on what needs to be improved.
- Readers must be able to recognise technical defects such as inadequate labelling, rotation, cuts-offs, scapular inter-position, artefacts, under-inspiration, under exposure (too light) and over exposure (too dark).

3. **Anatomical landmarks and other features of normal chest x-rays.**

- ROLDS readers must be familiar with the normal appearance and position on a normal plain PA chest x-ray of: the chambers of the heart, the pulmonary vessels, aorta, vena cava, trachea, major airways, diaphragms, normal pleural lines and muscular insertions.

4. **Organising time, space and systems to optimise performance.**

- ROLDS readers must know what is required in the reading workspace to optimise reading conditions.
- Systems must be in place to ensure that collateral information is available to maximise reading accuracy. Such information includes individuals' age, occupation and risks exposed to, years of exposure, previous medical history with particular reference to diagnosed tuberculosis or certified pneumoconiosis, and previous chest x-rays.
- Systems must be in place to ensure that findings in radiological surveillance are followed up and acted on.

5. **Features of occupational lung diseases in SA mining industry for which radiological medical surveillance is indicated.**

5.1 Epidemiology of occupational lung diseases in South Africa.

- Occurrence of OLD in the SA mining industry and resultant pre-test probabilities in ROLDS.
- Risk factors and exposure-response relationships for various OLD.

5.2 Clinical features and correlates of pneumoconiosis, COPD, asbestos-related diseases and tuberculosis in the SA mining industry.

5.3 Pathological features of pneumoconiosis, COPD, asbestos-related pleural disease and tuberculosis (with emphasis on their radiological correlates).

5.4 Radiological features of simple silicosis and Coal Workers' Pneumoconiosis.

5.5 Radiological features of Progressive Massive Fibrosis (PMF)

5.6 Radiological features of asbestosis.

5.7 Radiological features of benign asbestos related disease.

- Hyaline (non-calcified) localized plaques and calcified plaques
- Visceral pleural reactions
  - Diffuse pleural thickening
  - Benign asbestos-related effusions
  - Lobular or round atalectasis

5.8 Radiological features of lung cancer

5.9 Radiological features of mesothelioma.

5.10 Radiological features of COPD.

5.11 Radiological features of tuberculosis.

5.12 Radiological features of other abnormalities that are sufficiently commonplace to be encountered in radiological surveillance programmes.

5.13 Radiological differential diagnosis of pneumoconiosis, including conditions such as sarcoidosis and tuberculosis.

5.14 Radiological features of silicosis complicated or modified by tuberculosis.

6 **The ILO Radiological Classification of the Pneumoconioses**.

- ROLDS readers should be familiar with the purpose and use of the ILO Radiological Classification of the Pneumoconioses (Geneva, 1980)

## 7. Reporting and referral in ROLDS.

- Recommended practice is that a set of x-ray films is first reviewed by scanning through to separate out definitely normal films from those that are either borderline abnormal or definitely abnormal. This is termed the "scanning routine". Potentially abnormal films are then reviewed and classified, taking into account previous radiographs, if they are available. This is termed the "confirmatory routine".
- The recommended classification of abnormalities for use in ROLDS with its implications for reporting and referral should be understood.

**8. Medico-legal and ethical responsibilities in ROLDS.**

- ROLDS and responsibilities related to ROLDS are governed by statutes, principally the MHS Act and the ODMW Act.
- ROLDS practitioners owe the same ethical responsibilities to ROLDS participants as they would to any patient.

**9. Using and viewing digital copies of x-ray films.**

- The advantages, disadvantages and use of software to view digital copies of x-rays must be understood by ROLDS practitioners in order to fully utilise the products from Health 803.

# 6. Development of Training Methods and Materials

Training materials for radiological medical surveillance skills have been developed during the course of Health 803. The primary product is uniquely based on a CD-Rom, which enables it to be widely accessible and affordable.

Development and delivery of the training materials has resulted in two distinct but inter-related products on the CD. The first comprises a formal "Symposium" by a faculty of recognised experts in the fields of occupational lung diseases and radiology, covering the ROLDS curriculum. This is the traditional format for such teaching and the sound and slides used in the symposium were captured to develop a CD-based nearest possible equivalent.

The second product is a "Simulation" which uses high resolution digital copies of miners' x-rays to simulate recommended practice in ROLDS and to enable participants to self-test and to be externally evaluated. Libraries of research chest radiographs of SA miners were identified and copied digitally as detailed below. This process was highly selective and mainly based on films of good quality where there was good inter-observer agreement.

The process of developing the materials for these two products was carried out in parallel. In this chapter, the development process for the products is detailed.

### 6.1 The Symposium.

The original symposium took the traditional format of post-graduate medical training. The first part took the form of illustrated lectures that were digitally sound recorded. These covered the curriculum outlined in 3 above. The second part of the programme took the form of a hands-on training session where small groups interacted with a radiologist for two hours. Finally, participants were introduced to an early version of the simulation software.

The symposium was held in February 2002 at Four Ways, Gauteng. The programme is detailed in Table 6.1.1. Twenty three participants were invited to attend as a part of Group 1, as detailed in Section 5 below.

The programme was successfully completed as detailed, with the exception of Session 7 wherein it was hoped that participants would have the opportunity of completing a ROLDS exercise. Unfortunately, due to a combination of software and hardware problems, it proved possible only to demonstrate the ROLDS simulation and not for all participants to complete an exercise as had been planned.

Table 6.1.1: Symposium on Radiological Surveillance for Occupational Lung Disease – Programme.

**RADIOLOGICAL OCCUPATIONAL LUNG DISEASE SURVEILANCE (ROLDS)**

# INDABA HOTEL, HARTEBEESPOORTDAM ROAD, FOURWAYS, JOHANNESBURG

**FRIDAY 15 & SATURDAY 16 FEBRUARY 2002**

| | | FRIDAY 15 FEBRUARY 2002 | | |
|---|---|---|---|---|
| 09h00 - 09h30 | | Registration : *Foyer, LT5* | | |
| | Ref | Session 1 : ***LT 5*** | **Presenter** | **Mediu** |
| 09h30 - 09h40 | 1 | Introduction | Neil White | Data Project |
| 09h40 – 10h40 | 2 | Epidemiology, clinical significance and pathology of the occupational lung diseases, including tuberculosis. | Neil White and Jill Murray | D |
| 10h40 – 11h00 | 3 | Essential principles of physics in radiology. | Ray GlynThomas | D + 1 s projecto |
| 11h00 – 11h30 | | T E A : *Foyer, LT5* | | |
| | | **Session 2** : *LT 5* | **Presenter** | |
| 11h30 – 11h40 | 4 | The technically acceptable chest x-ray. | Elmien LeRoux | D |
| 11h40 – 12h10 | 5 | Anatomical landmarks and other features of normal chest x-rays. | Hillel Goodman | D |
| 12h10 – 12h30 | 6 | Common technical defects limiting the acceptability of chest x-rays. | Elmien LeRoux | D |
| 12h30 – 12h50 | 7 | The role of the radiologist in occupational chest disease. | Albert Solomon | D or sli |
| 12h50 – 13h00 | 8 | Organising your work time, space and systems for optimal performance. | Elmien LeRoux | D |
| 13h00 – 14h00 | | L U N C H :: *Hotel dining room* | | |
| | | **Session 3** : *LT 5* | **Presenter** | |
| 14h00 – 14h45 | 9 | Radiological features of silicosis and CWP. | Ray GlynThomas | D + 2 s |
| 14h45 – 15h10 | 10 | Radiological features of tuberculosis | Khanya Mashao | D |
| 15h10 – 15h30 | 11 | Radiological features of some other conditions that may be detected during radiological surveillance | Hillel Goodman | D |
| | | | | |
| 15h30 – 16h00 | | T E A : *Foyer, LT5* | | |
| | | **Session 4** : *LT 5* | **Presenter** | |
| 16h00 – 16h45 | 12 | Radiological features of silico-tuberculosis | Albert Solomon | Slide |
| 16h45 – 17h00 | 13 | Radiological features of lung cancer | Hillel Goodman | D |
| | | | | |
| 19h30 | | Dinner (all delegates and speakers are invited) : *Indaba Hotel dining room* | | |

| | | | | |
|---|---|---|---|---|
| | | **SATURDAY 16 FEBRUARY 2002** | | |
| | | **Session 5** : *LT 5* | **Presenter** | |
| 08h00 – 0845 | 14 | Radiology related to asbestos exposure | Albert Solomon | Slide |
| 0845 – 09h25 | 15 | An introduction to the ILO Radiological Classification of the Pneumoconioses | Ray GlynThomas | D + sli |
| 09h25 – 09h35 | 16 | Radiological features of COPD. | Khanya Mashao | D |
| 09h35 – 09h45 | 17 | Radiological features of sarcoidosis | Hillel Goodman | D |
| 09h45 – 10h00 | 18 | Medico-legal and ethical responsibilities in radiological surveillance. | Lindiwe Ndelu | D |
| 10h00 – 10h15 | 19 | Reporting, referral and using training software for ROLDS. | Neil White | D |
| 10h15 – 10h30 | | Discussion | | |
| 10h30 – 11h00 | | T E A : *Foyer, LT5* | | |
| | | **Session 6** : *LT 5* | | |
| 11h00 – 13h00 | | Small group interactive sessions with the four radiologists on the faculty.<br>Each will have a different set of x-ray films and viewing boxes.<br>Participants will be divided into four groups and spend 30 minutes with each radiologist. | | |
| 13h00 – 14h00 | | L U N C H : *Hotel dining room* | | |
| | | **Session 7** : *LT 3* | | |
| 14h00 – 17h00 (Self timed) | | Participants are asked to take part in a self-evaluation exercise using software designed to show a series of about 100 CXR films. | | |
| 17h00 | | Closure on completion of exercise. CPD certificates available. | | |

### 6.1.2: Draft requirements for presentations

In order to facilitate the conversion of the Four Ways Symposium into its digital equivalent, Faculty were asked to provide their symposium presentations in the following format:

All use Power Point 95 (or other widely available/accessible software) format with a minimum of two and a maximum of six slides.
All prepare an outline of an accompanying audio presentation of the approximate length as outlined in table 4.1.1.
All to prepare a draft (recorded) of their audio presentation.
All obtain six to ten chest radiographs, CT scans or other material illustrative of their topic.
All use a similar presentation format that requires a minimum of bytes.
All presenters collaborate with Prof White to minimise overlap and ensure full coverage of the curriculum.

Provision of all material in such a format would have greatly facilitated the ultimate conversion of all contribution into the CD symposium. However, it was apparent that few of the Faculty were sufficiently familiar with digital presentations to comply with these requirements, or to provide original radiographs for high resolution digital copying. Although it proved possible to assist most Faculty members to comply with most of the above requirements, as detailed in 6.1.1 two of the senior Faculty members used slides in their presentations. This was accommodated by allowing these presentations in traditional 35 mm slides. The 35 mm slides were then digitally photographed and, where appropriate, equivalent Power Point slides were created. Digitally copied 35 mm slides do not have the same resolution as high resolution copies of original x-ray films. This compromise in quality of some visual material was unavoidable. The compromise was thought to be acceptable since it still meant that the 35 mm slides that the senior Faculty had collected over many years and considered to be of high educational value could be copied and made available through the symposium product.

### 6.2 CD-based training programmes

The CD product from Health 803 essentially comprises three separate products. Each of these can be developed further to enhance the usefulness of the whole product.

**Product 1:** ROLDS: the Symposium.

The Symposium is currently a multimedia CD-based audio capture of lectures and visual material presented at the Four Ways Symposium. The audio material required significant editing to ensure continuity and to signal when slide changes need to be made. The visual material contained on the CD is encrypted to prevent its unauthorised copy and use. The audio material cannot be copy protected. Currently all sound files are in .MP3 format and needed to be loaded into a media player to be heard. This is clumsy and seems to be beyond the ability of some participants. A more user-friendly presentation format is still being sought for future versions. The symposium can easily be added to with new lectures, as required.

**Product 2:** ROLDS Simulation: Self-evaluation.

The self-evaluation component of the CD is currently a sub-routine of the External Evaluation product, since it utilises films from the same database. The essential difference between these two routines currently is that when the participant uses a self-evaluation routine he or she can receive feed-back at the end of the session. This feed-back comprises the "correct" answer and the ability to review each film in the exercise in conjunction with this.

The self-evaluation component is an area of the product for future development. It is envisaged that this component will have its own database of films, distinct from the external evaluation component. This will mean that all films in the external evaluation product remain as "unseen". This component will be utilised for tuition in the use of the ILO Radiological Classification of the Pneumoconioses.

The self-evaluation component currently has an identical appearance for the user and will therefore not be detailed independently from the External Evaluation product.

**Product 3:** ROLDS Simulation: External evaluation.

The external evaluation component of the ROLDS simulation has been developed ostensibly to allow participants to have their classification of chest radiographs on the CD database reviewed by another party. The process of reviewing participants' responses as a part of Health 803 has also contributed to validation of the database itself as well as the validation of a digital based external review process.

Detailed below is the process followed in assembling this product. Necessary steps included selecting appropriate x-rays to copy and specifying in detail what was required in terms of software.

### 6.2.1 **Selection process for x-rays.**

A number of current or recent epidemiological studies of occupational lung disease among SA miners had the potential to provide source material for the CD. The primary source of material was a study of former Free State gold miners from Lesotho that was close to completion. In this study > 600 men had each had two large plate x-rays performed at the Anglogold Health Services Occupational Health Centre in Welkom approximately one year apart. Reading of each of these films these by four readers (Neil White and Rodney Ehrlich of UCT, Jack Parker of West Virginia U and Daniel Banks of Louisiana State U) was completed in August 2001 and subsequent preliminary data entry allowed this source of material to be systematically searched.

The database search criteria for films as source material were:

1) The film is of good quality (Grade 1);
2) The film is considered normal by all readers; or
3) The film is considered to show pneumoconiosis 1/1 or greater and three or more readers agree on the grade within only one ILO sub-category.
4) The film is considered to show evidence of tuberculosis only by three or more readers, and there is a history of bacteriologically proven tuberculosis; or
5) The film is considered to show pneumoconiosis 1/1 or greater and three or more readers agree on the grade within one ILO sub-category, three or more readers also agree that that the film shows no evidence of tuberculosis.
6) The film is considered to show pneumoconiosis 1/1 or greater and three or more readers agree on the grade within one ILO sub-category, three or more readers also agree that that the film shows evidence of tuberculosis and there is a history of bacteriologically proven tuberculosis.
7) The film is considered to be borderline (0/1 or 1/0) by three or more readers; or
8) The film is unreadable (Grade 4) or shows an illustrative technical defect (Grades 2 or 3).

Profs Solomon and White had collaborated with Dr Rajen Naidoo in a SIMRAC Project concerning the respiratory health of coal miners in South Africa. Dr Naidoo provided, for digital copying, 30 grade 1 films from the study where the film is considered to show CWP of profusion 1/1 or greater and both readers agree on the profusion within one ILO sub-category and 50 films considered to be 0/0.

Both of these primary studies had Research Ethics Committee approval from their respective universities (UCT and U of Natal). In both original studies, no x-rays carried any personal identifying details other than a study number.

From the original research databases the x-rays were correlated with the individual's age, occupation, exposure, years of exposure.

The optimal numbers of films meeting the above criteria that were required for the CD were considered to be:

1) 50 films showing pneumoconiosis;
2) 50 films showing tuberculosis;
3) 50 films showing silico-tuberculosis;
4) 150 or more normal films from gold miners and 50 normal films from coal miners;
5) 20 or more unreadable or technically inadequate films. (total 320)

The actual composition of the current database can be described as:

1. 38 films showing pneumoconiosis, 21 of which have a prior film for comparison.
2. 18 films showing tuberculosis only, of which 12 have a prior film for comparison.
3. 41 films showing pneumoconiosis and tuberculosis, of which 21 have a prior film for comparison.
4. 126 films considered normal, of which 82 have a prior film for comparison.
5. 9 technically inadequate films and 1 other abnormality. (total 369)

### 6.2.2 Software Specifications of CD products.

Health 803 required the development of software for an interactive learning product. This required detailed conceptualisation in the form of a software specification. This specification attached as Appendix 1 and is included both as a measure of how well the product ultimately met its specifications and out of interest for others who may attempt a similar task. Deviations from the specification (many of them positive) are noted in the text in parentheses in the appendices.

## 6.3. Evaluating skills in Radiological Occupational Lung Disease Surveillance

Health 803 proposes the development of a means of evaluating skills in performing ROLDS. From the point of view of the project, skills evaluation is necessary to evaluate the relative benefits of the training materials and methods developed during the course of the project (as detailed in section 7 below).

From the standpoint of standards of practice in the mining industry, development of a means of evaluating proficiency to perform reading of surveillance radiographs is desirable. Historically there has been some diversity in the professional backgrounds and practices of the professionals who read surveillance radiographs. Regulations relating to radiological medical surveillance in terms of the MHS Act are imminent. It is explicit in the Act that such tasks should be performed by competent persons.

Established proficiency is an important part of any health professional's esteem and can be used to positive advantage in the job market place. Prospective employers will know that the professional has proven proficiency. Certification of proficiency also offers protection for health professionals since they should not be required to perform tasks for which they have not been adequately trained. Established proficiency is also an important consideration for clients in a surveillance programme.

The manner in which skills are evaluated and graded will be refined as Health 803 progresses. There will need to be an initial period during which norms are established, for example for the time required toread films.

An example of how grading is carried out in a similar examination is that of the B reader certification program in the United States. For full details see Wagner GR, Attfield MD, Kennedy RD, Parker JE. The NIOSH B Reader Certification Program. An Update Report. Journal of Occupational Medicine 1992; 34: 879 – 884. The requirements for the B reader programme seem more elaborate than might be required here.

The B reader exam itself comprises 125 PA chest x-rays that have been graded by an expert panel of 10 readers. About 50% of the x-rays have Pn of profusion 1/0 or greater. The x-rays themselves are copies and dozens of sets with viewing boxes must be available for each exam! The exam is divided into 4 sections for grading purposes: Small opacities, large opacities, pleural abnormalities or other and these sections are weighted (60 + 20 + 10 + 10 respectively). Within the major section concerned with small opacities candidates are marked on three scores related to a) agreement on presence/absence, b) over-reading or under-reading tendency; and c) an inconsistency index. Both b) and c) relate to the variation between the candidate and an expert the panel in their readings of the profusion of small opacities over the full 12 point ILO scale. The inconsistency index is calculated once the candidate's over-reading or under-reading tendency has been corrected for. Agreement on presence/absence alone is used to evaluate candidates' performance with respect to large opacities, pleural and other abnormalities.

Agreement on presence/absence is based on the false positive and false negative percentages. The percent false positive (PFP) is the percent of time the candidate said that a film was positive when the expert panel said that it was negative. The percent false negative (PFN) is the percent of time that the candidate said that the film was negative when the panel said positive. Scoring is accomplished by first summing the PFP and PFN, then multiplying by a factor (e.g. 0.4 if the score for that section is 20, 0.2 if the score for that section is 10) and subtracting the result from the points available for the section. As an example, if a section is weighted as being worth 20 points, the maximum and minimum points for that section are 20 and 0 respectively. Let us say the candidate in this section obtains 8% false positives and 32% false negatives the score is calculated by 20 – [(8 + 32)] x 0.4 = 4 points. This system is devised so that if PFP + PFN > or = 50% then no points are awarded.

In the B reader exam a candidate needs a combined score of at least 50 out of 100 to pass the examination. The pass rate in the certification exam is in the region of 47% whilst it is 67% for re-certifications (which must occur every four years). The most useful features of B reader grading system for the purposes of Health 803 appear to be the division of the exam into weighted sections and the measurement of agreement on presence/absence of abnormalities.

Health 803 differs from the B reader exam because it is directed specifically to development of competencies for radiological surveillance as required by statute. The B reader exam certifies competency to diagnose and grade the severity of Pn in accord with the tenets of the full ILO classification.

Health 803 also differs from the B reader format in that it utilises a digital platform whereas the B reader still uses the classical film medium. There are several reasons for this. The first is that copies of films are expensive and always of poorer quality than the originals. NIOSH has not entirely solved this problem and nor has the ILO. Even the best facilities in SA leave the College of Medicine unhappy with the quality for their radiology exams. Film copies are not durable, are bulky and they require viewing boxes which then commits the whole exercise to the clumsy business of occasional centralised seminars and exams.

The classical x-ray film medium seems destined to become a clearly recognisable 20 th century technology. Today, film medium for x-rays has all but disappeared in most US hospitals with everything from CT scan to chest x-ray images being stored and viewed entirely digital. Similar developments are already taking place in the private and public health care sectors in South Africa. Dicom and JPEG files appear to be the current standard format. Digital images from scans have obviously been available for quite some time and lend themselves to easy dissemination for training purposes through the kind of medium envisaged for Health 803, both for training and evaluation purposes. By using similar technology Health 803 solves problems associated with poor quality, non-durable and expensive film copies, dispenses with the clumsy paraphernalia of viewing boxes, centralised CPD and exams whilst providing a durable product that will be in step with 21 st century technology.

### 6.3.1 Proposed grading in performing ROLD Surveillance.

Recommended practice is that a set of x-ray films is first reviewed by scanning through to separate out definitely normal films from those that are either borderline abnormal or definitely abnormal. Potentially abnormal films are then reviewed, confirmed as being abnormal and classified, taking into account any data available from history and previous radiographs, if they are available. Accordingly candidates will be evaluated in the scanning exercise for ability to detect presence/absence of abnormality. In the confirmatory exercise they will be evaluated on ability confirm presence/absence of a particular abnormality. These two exercises are given equal weight.

A. Scanning exercise (weight = 50)

The candidate will review 50 films
There are 5 – 15% abnormal/unacceptable films in the series.
Films should be classified as normal, abnormal or technically inadequate.
Candidates will be evaluated for agreement on presence/absence of abnormality.
Scheme 1: 1 mark for correct classification.
Scheme 2: 1 mark for most preferred correct answer, ½ mark for the least preferred correct answer (if one exists).

B. Confirmatory exercise (weight = 50)

The candidate reviews 25 films
There are approximately 20 abnormal/unacceptable films in the series.
Films must be classified according to the system used in Table 6.3.1.
Scheme 1: 1 mark for correct classification.
Scheme 2: 1 mark for most preferred correct answer and ½ mark for up to two least preferred correct answers (if they exist).

Two schemes for marking exercises were developed.

6.3.1.1 Marking Scheme 1.

This scheme was developed prior to participants' use of the exercises. It is based on the reading of the films in the series by the expert panel as detailed in 6.3.1 above. Films had been selected on the basis of technical quality and good reader agreement on presence and type of abnormality that the films showed. Based on these readings films were allocated to categories such as normal, technically inadequate, Pn, Pn + TB, other. The original readers of the films had been blinded to occupational and medical history related to the films and films were not read as series, as is usual in epidemiology. This additional information had to be interpolated with the expert readers' classification by Prof White in order to appropriately classify films in terms of table 6.3.1.

6.3.1.2 Marking Scheme 2.

This scheme was based on a re-evaluation of Scheme 1, based on the 18 participants' returned exercises that were available by 25 September 2002. These returns included more than 3 500 classifications of films in either scanning, confirmatory, self-test or external evaluation routines. Each film was evaluated for its performance in both the scanning and confirmatory routines. Most films had been read by multiple readers (usual range 6 – 8 readings) and it was therefore possible to identify films where many participants had not given the correct answer as per Scheme 1. All films were then carefully scrutinised to identify and if necessary change any answers. This was carried out on the following basis:

a) Scheme 1 contained a small number of incorrect answers if all slide details and prior films were properly taken into account. These were in many instances identified by participants and were corrected.
b) Films were regularly identified by participants as being technically inadequate, but had not been incorporated on that basis. All such films were carefully scrutinised. If the digital copy of the film had a substantial defect and >70% had identified this then the most preferred correct answer was changed to reflect this. If 30 – 70% of participants had identified the film as technically inadequate then this category was entered as the least preferred correct answer for the film.
c) Participants' occasionally identified "other abnormalities" on films entered in the database on the basis of their being considered normal by the expert panel. Where comments were entered it was apparent that this was usually either on the basis of hyper-inflated lung fields or borderline cardiomegaly. In the classification in 6.3.1 this category should only be used if further diagnostic evaluation is warranted. In most instances "other abnormality" was accepted as a least preferred correct answer.
d) The answers in Scheme 1 were taken as the most preferred correct answers, unless corrected in terms of any of the conditions above. Participants non-concordant answers were evaluated and up to two least preferred correct answers were identified. The criteria for accepting a least preferred correct answer was that it would not necessarily disadvantage a ROLDS client either clinically or medico-legally. Incorrectly calling films technically inadequate complies with this criteria since it would result in a film being repeated and nothing more. Other examples of acceptable least preferred correct answers would be calling a 2b film (Pn as before) a 2c (Pn with progression) or calling a film 6 Pn + TB current, when the film is just a 4 (TB current).

Table 6.3.1: Classification of abnormalities detected in radiological surveillance for use in the ROLDS Confirmatory Exercise.

| Symbol | Significance |
|---|---|
| 0. | Technically inadequate film.<br>Repeat film. |
| 1. NAD | No abnormality detected<br>No specific action required |
| 2a. Pn new case<br>2b. Pn as before<br>2b. Pn with progression | Significant pneumoconiosis seen<br>Review past films for significant interval change<br>Classify film according to ILO symbols for small and large opacities (see Fig 1.)<br>Arrange for counselling of employees with new abnormalities.<br>Refer for benefit examination if appropriate and not already done |
| 3. TB as before | Signs consistent with tuberculosis seen<br>Past films show no interval change<br>No specific action required |
| 4. TB Current | Signs consistent with tuberculosis seen<br>Either no past films available or there is significant interval change<br>Refer for diagnostic evaluation in TB/medical service.<br>Refer for benefit examination if appropriate and not already done |
| 5. Pn + TB as before | Signs consistent with TB and significant pneumoconiosis<br>Manage as for (2) above |
| 6. Pn + TB Current | Signs consistent with TB and significant pneumoconiosis<br>Manage as for (4) above.<br>Refer for benefit examination if appropriate and not already done |
| 7. Other | Other significant abnormality seen (e.g. pneumonia, pleural effusion or cardiac enlargement).<br>Review past films for significant interval change.<br>Refer for radiological diagnostic evaluation and/or referral to an appropriate medical service. |

### 6.3.2 Certification of Competency to perform readings of radiological medical surveillance.

Certification of competency can take place at a number of levels. The most straightforward method is Continuing Professional Development (CPD) points. This is a substantive course and the symposium participants at Fourways all earned 13 CPD points. This not only awards attendance for the course, but also provides a certificate to attest attendance. This form of certification is appropriate to Health 803 and will be the main form utilised initially. CPD accreditation for using the ROLDS Symposium and Simulations has been applied for through the CPD Accreditation Office, UCT. This application will be reviewed by the appropriate University and HPC sub-committees.

Health 803 aims to make a permanent difference to radiological surveillance in SA and therefore a more enduring form of certification is also envisaged. The registration of a competency such as envisaged here is in accordance with qualifications in terms of the National Qualifications Framework, wherein it is required that qualifications must:

- present a planned combination of outcomes
- have a definitive purpose or purposes
- be fit for purpose
- provide a basis for further learning

Health 803's contribution to professional development seems equivalent to a SAQA unit standard as a short course. It is the intention of Health 803 to appropriately register the training course.

After discussions over such issues within Faculty, with Prof J P van Niekerk and further investigation of the SAQA framework it is apparent that the registration of a course requires certain personal and institutional undertakings, course details and compliance with guidelines. In view of these and because the UCT Lung Institute is the primary contractor in Health 803, if this course of action were followed and the ROLDS training were registered on the SAQA Short Course Database it would require UCT School of Public Health or UCT Lung Institute as the Provider and Prof White as the Facilitator.

It is apparent that Health 803's contribution to professional development is less substantive than the post-graduate Diplomas offered by the College of Medicine. However there have been new proposals within the Health Professions Council of SA (HPCSA) that favour the future registration of competencies such as those envisaged by Health 803 with the HPCSA. A sub-committee of the HPCSA, meeting on 26 March 2001 made the following resolutions that:

b) a system be put in place whereby all medical practitioners be able to acquire, certify and register the necessary competencies to perform any particular procedures relevant to their disciplines, including diagnostic and therapeutic procedures;
c) regulations should be formulated whereby it would be possible to govern the minimum requirements with regard to the competencies needed by general practitioners and specialists to perform the procedures relevant to their disciplines;
d) such minimum requirements should be envisaged and developed by peer groups working under the same conditions for consideration and approval by the Executive Committee of the Board.

These are proposals have signposted the way that professional development is seen as proceeding by the HPC, and have informed the direction in which Health 803 has been developed. When the ROLDS development and evaluation process is sufficiently mature this will be registered with the HPCSA.

# 7. Study B: A comparison of traditional classroom and distance learning as preparation for skills evaluations for readers in Radiological Occupational Lung Disease Surveillance.

## 7.1 Introduction.

As detailed in above, two training products were developed for Health 803. One was a traditional *viva voce* symposium and the other is a CD Rom-based training programme. The study will compare the outcome of two groups of medical practitioners' performances in an equivalent skills evaluation exercise following exposure to a formal training symposium only (Group 1) vs a CD Rom-based training only (Group 2). The hypothesis being tested is that there is no difference between the two groups in the performance of the same self-evaluation exercise where the primary outcome measured is percent in a test.

## 7.2 Subjects and Methods

**Study design and population:** a study of the outcomes in evaluations of two groups of medical doctors in a skills evaluation process for radiological medical surveillance relevant to the South African mining industry. Eighty three potential candidates for the study were identified by the telephonic survey detailed in Section 4 above. All potential candidates identified were sent written invitations to participate in the study with a deadline for response. Those accepting conditions for participation were randomised (taking into account the operational requirements of their services) to either Group 1 or Group 2. Group 1 attended the formal training symposium in February 2002 and were subsequently sent product 2 & 3 and asked to perform an externally evaluated exercises as directed by the product. Group 2 was provided with a CD Rom based virtual symposium and the same CD Rom based self-evaluation exercise. Group 2 was asked to perform the exercise twice – once before and once after making use of the virtual symposium.

**Sample size and statistical power:** the telephonic survey carried out above (section 4) identified 95 practitioners associated with ROLDS in the SA mining industry, of whom 83 were medical practitioners. If participants accepted randomisation and are randomised to either group 1 or 2 by an accepted procedure the required sample size of candidates completing a self-evaluation to detect a mean difference in scores of 5% with 80% power between the groups is 16. With a sample size of 25 completing the self-evaluation in each group a 5% difference in mean scores in the groups would be detected with 94% power.

**Randomisation:** Participants were randomised subsequent to their accepting their invitation to participate. 46 participants' names were placed in a box and 23 names were drawn for Group 1 by a person with no involvement in Health 803. These potential participants were all invited to attend the *viva voce* symposium. 4 invitees to Group 1 subsequently indicated an inability to attend because of operational requirements of their practices. They were then assigned to Group 2 and further

names were drawn from the box to replace them. Some withdrawals took place too close to the date for replacements and consequently Group numbers were not equal.

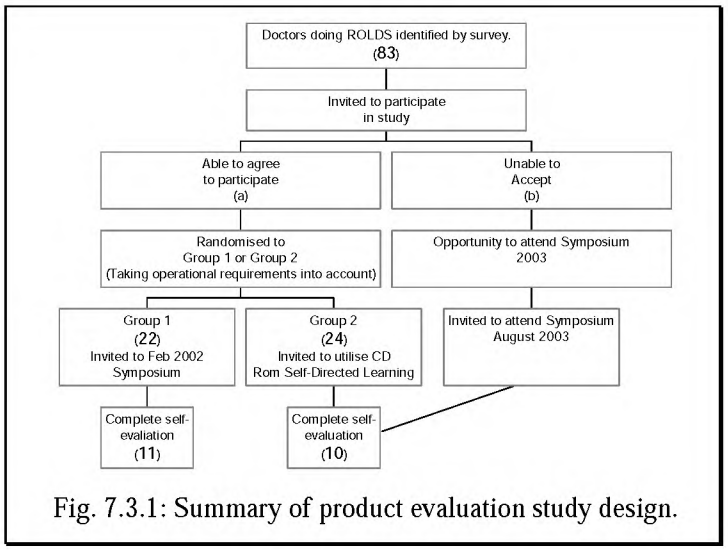



Fig. 7.3.1: Summary of product evaluation study design.

**Implications of Participation: Group 1:** All participants in this group were invited to a two-day symposium on Radiological Surveillance for Occupational Lung Disease (as applied to the SA mining industry). The symposium programme is detailed in 6.1.1 above. Attendance at the symposium was free of charge, although participants were required to meet their own costs for travel, accommodation and breakfast. CPD points were awarded for attendance.

**Group 2:** Participants randomised to this group were sent the CD-Rom products developed in the course of Health 803. Prior to February 2002 Group 2 participants could still be randomly invited to become a part of Group 1 if there were any drop-outs from Group 1 prior to the symposium. Subsequently participants in this group were sent a CD-Rom based version of the same symposium attended by Group 1. They were also be sent a CD-Rom based Products 2 and 3 as detailed above. Participants were asked to submit the results of self-evaluation exercises via the internet or on disk. Participants were followed up to encourage their full participation. Participants who submitted the results of a self-evaluation exercise are to be invited to attend a similar two-day symposium on Radiological Surveillance for Occupational Lung Disease (as applied to the SA mining industry) that will be held in late 2002 or early 2003, contingent on continuation funding being available from SIMRAC. Similar conditions will apply as at the February 2002 symposium.

**Measurements made**: demographic and other details of 83 eligible participants were already known. Both groups were sent an equivalent digital evaluation exercise. The primary outcome of interest is percentage obtained in an evaluation that incorporates a scanning exercise of 50 films and a confirmatory exercise of 25 films. The percentage was based on two marking schemes as detailed in Section 6. Scheme 1 gave 1 mark for each correct answer in the scanning exercise and 2 marks for each correct answer

in the confirmatory exercise and 1 mark if the second answer given was correct. The correct answers were based on expert readings of the original radiographs (which were blinded to patient history and not read to make comparisons). Scheme 2 gave 1 mark for the most preferred correct answer and ½ mark for the least preferred correct answer (if there was one) in the scanning exercise and 2 marks for the most preferred correct answer in the confirmatory exercise and 1 mark for up to two alternative least preferred correct answers (if appropriate to the film). The correct answers in Scheme 2 were based on an iterative evaluation of the most preferred and least preferred correct answers for films or pairs of films that took into account expert readings, patient history and returned evaluations. The latter were utilised to identify films that when viewed digitally might be considered to be technically inadequate.

**Risks:** Lack of interest among practitioners for the project could ultimately result in small numbers for comparisons. This was countered by email and telephonic follow-up of participants. Rewards in the form of CPD points were offered for completion of the exercises. Lack of computer literacy was be countered by making materials as accessible and convenient to use as possible and by providing email or telephonic support if difficulties arose.

**Ethical considerations:** all analyses of participants' outcomes are confidential and such that individual participants can in no way be identified. Individual outcomes in evaluations will only be made known to the individual concerned if requested. The only exception may be that the name of the person(s) achieving best overall scorings be publicised.

**7.3 Results.**

22 medical practitioners were randomised to Group 1 and 24 to Group2. 21 Group1 members actually attended the symposium. The study was closed at the end of October 2002. At that point:

- 24 out of 46 possible participants had returned at least one exercise;
- 14 were in group 1 & 10 were in group2;
- 2 returns were not complete (could not be evaluated) and 1 participant returned one confirmatory exercise only;
- 13 participants returned 2 complete exercises;
- 1 returned 4 exercises;
- 1 returned 12 exercises; and
- a total of 34 Scanning and 37 Confirmatory exercises were returned and could be evaluated.

Participant 43 (who returned 12 exercises) has results detailed individually below. Only the first two and last two results from this participant were included in the main analysis that follows, so that this individual did not unduly weight results.

Demographic details of the two groups, as randomised, are contained in table 7.3.1. Groups 1 and 2 had comparable composition in terms of gender, year of graduation, films read per week and D.O.H. Group 1 contained a preponderance of primary readers from the coal sector.

Table 7.3.1: Demographic Comparison of Groups 1 and 2.

| Variable | Group1 | Group 2 |
|---|---|---|
| Participants | 22 | 24 |
| Males | 18 | 19 |
| Primary Readers | 18 | 13 |
| Referral Readers | 3 | 6 |
| Gold sector | 2 | 7 |
| Coal sector | 7 | 2 |
| D.O.H. | 15 | 16 |

In figures 7.1 and 7.2 all participants' outcomes in the scanning and confirmatory exercises are depicted according to marking Schemes 1 and 2. In the scanning exercise Scheme 2 resulted in uniformly improved results. 5 participants did not achieve 50% using Scheme 1, compared to 2 using Scheme 2. The highest mark achieved was 88% using Scheme 1, compared to 92% with Scheme 2. The lowest mark achieved was 30%. In the confirmatory exercise, use of Scheme 2 did not uniformly improve results. Using either Scheme 1 or 2, few participants were able to achieve over 50% in a confirmatory exercise. The highest mark achieved was 60% and the lowest was 8%.

Participants' marks achieved were correlated with a number of other details available, including the time taken for the test, their year of graduation, the number of films they usually read and the mining sector that they usually work in.

In figure 7.3 it is shown for the scanning exercise that time taken to complete the exercise has little bearing on the marks achieved. One participant took a great deal of time and effort to complete four full exercises, adding many valued comments on the films reviewed and taking, in one instance taking over 300 minutes to complete a scanning exercise of 50 films. This participant achieved above average marks and when these are removed as outliers there is no apparent correlation between time taken and outcome. The least time taken was 8 minutes and only four participants required over one hour for an exercise containing 50 films.

In figure 7.4 there is a trend for more recent graduates to perform better in the scanning exercise. This trend is not borne out in figure 7.5 showing the confirmatory exercise where year of graduation has no bearing on performance.

In figure 7.6 it is shown that there is a trend for participants who read fewer films to achieve better results in the scanning exercise. In the analysis of performance in the confirmatory exercise shown in figure 7.7a and b it is shown that there is a modest trend for the participants who read more films per week to achieve better results. In figure 7.7b the trend is sub-analysed for first and subsequent reading exercises. Readers of more films per week showed greatest tendency to improve their marks achieved on their second or subsequent exercises.

In figures 7.8 and 7.9 the outcomes in the scanning and confirmatory exercises are illustrated according to mining sector. It is not considered that there is any evidence for trends.

In figure 7.10 participant 43's 12 exercises are presented. There is a trend towards improvement with more exercises performed. To complete 12 exercises, 900 films must be viewed. 144 films would also have been viewed in the intervening self-test evaluations where the correct answers could also have been seen.

In Tables 7.3.2 and 3 the outcomes of Groups 1 and 2 are compared. Initial power estimates for the study indicated that a sample size of 16 in each group would be required to detect statistically significant differences if there was a difference of 5% in marks attained in the two groups. As it turned out, the differences between the groups were larger than 5% and therefore statistical significance was achieved.

In the comparison of Groups 1 & 2 using the Kruskal-Wallis comparison of means test, there was no significant difference in their proficiency in either the Scanning or the Confirmatory exercises when the results of all tests returned are pooled. The small sample size does make it possible that there is type 2 error (failure to detect a difference when one is present). Members of Group 2 significantly improved their proficiency from 58.1% in their first attempt to 74.2% in subsequent scanning exercises. Only 3 members of Group1 returned more than one exercise.

When results the results of all Confirmatory exercises were pooled Group 1 performed significantly better than did members of Group 2. Group 2 members did not show the same trend of improved performance with subsequent exercises.

In Table 7.3.4 the range of results encountered in all Scanning and Confirmatory exercises is presented. This range is thought to be a useful method of enabling participants to evaluate their own performance by comparison with peers.

Figure 7.1: Participants' outcomes in the Scanning Exercise according to two marking schemes.

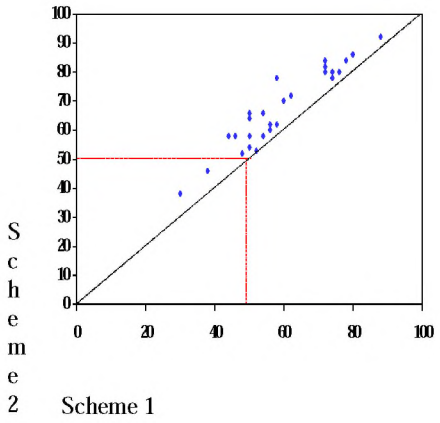



Figure 7.2: Participants' outcomes in the Confirmatory Exercise according to two marking schemes.

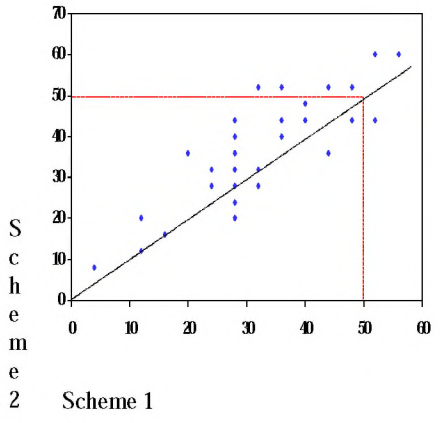


Figure 7.3a: Participants' outcomes in the Scanning Exercise according to time taken (minutes) (Marking scheme 2).

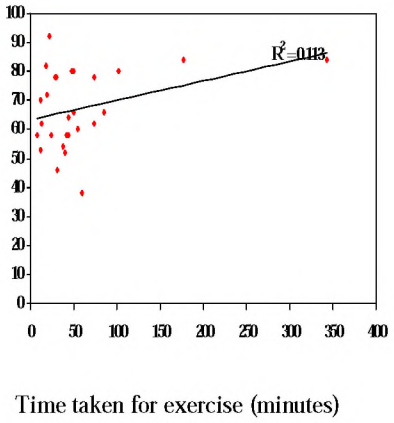



Figure 7.3b: Participants' outcomes in the Scanning Exercise according to time taken (minutes) (Marking Scheme 2) One outlier removed.

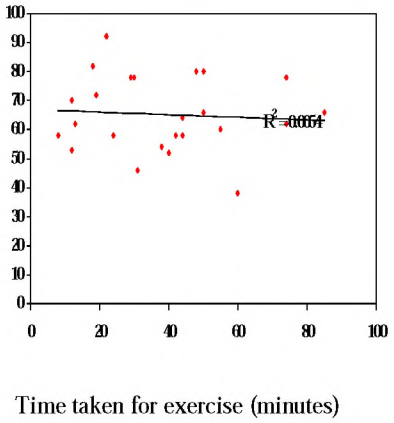


Figure 7.4: Participants' outcomes in the Scanning Exercise according to year of graduation.

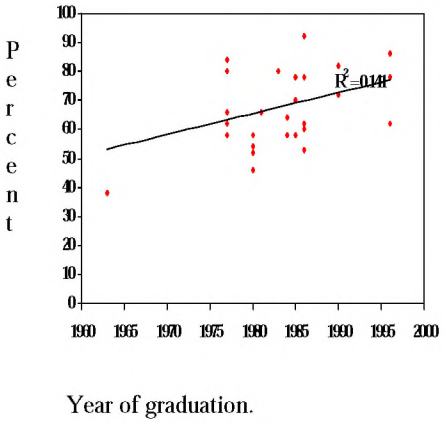



Figure 7.5: Participants' outcomes in the Confirmatory Exercise according to year of graduation.

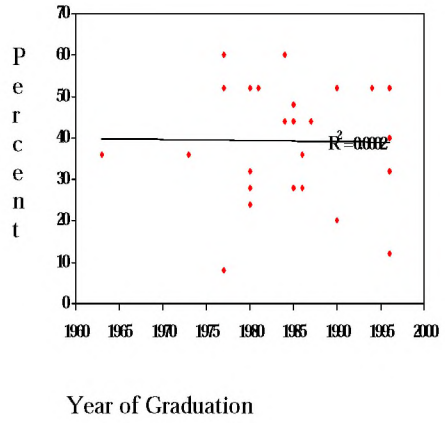


Figure 7.6: Participants' outcomes in the Scanning Exercise according to usual number of films read per week.

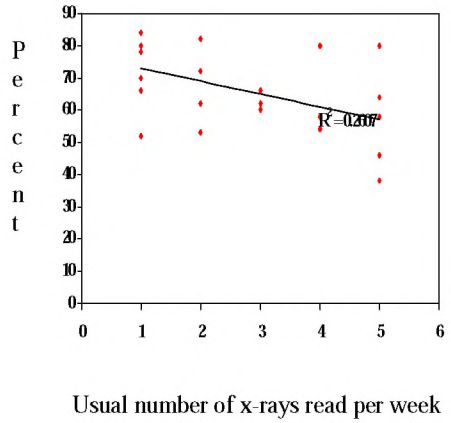
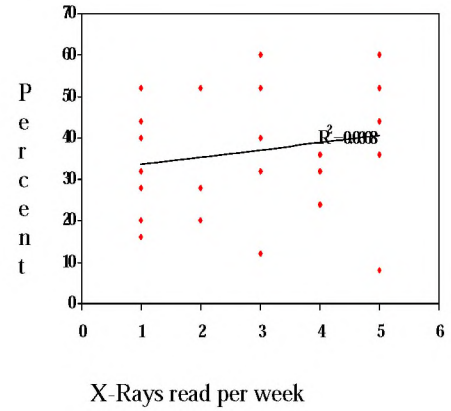



Figure 7.7a: Participants' outcomes in the Confirmatory Exercise according to number of films usually read per week.




1 = 1 – 20
2 = 20 – 50
3 = 50 – 100
4 = 100 – 200
5 = > 200 x-rays usually read per week

Figure 7.7b: Participants' outcomes in the Confirmatory Exercise according to number of films usually read per week.

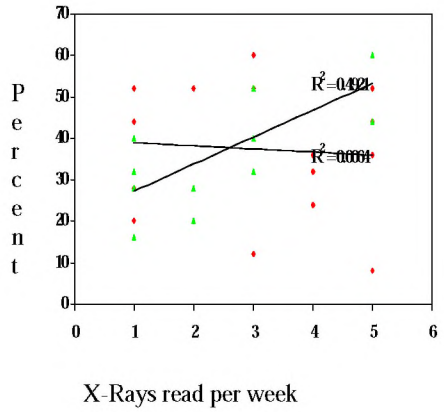


Figure 7.8: Participants' outcomes in the Scanning Exercise according to mining sector.

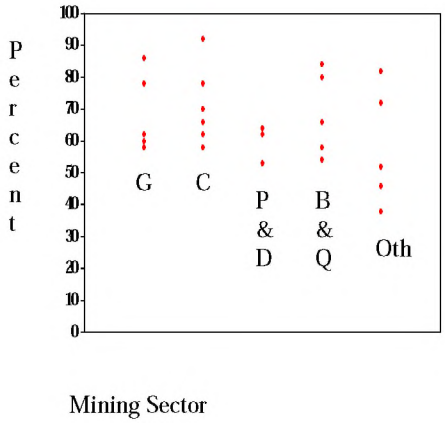
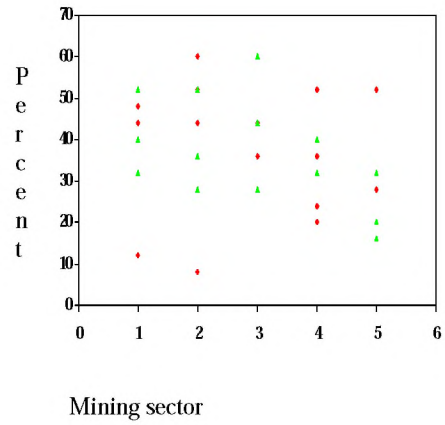
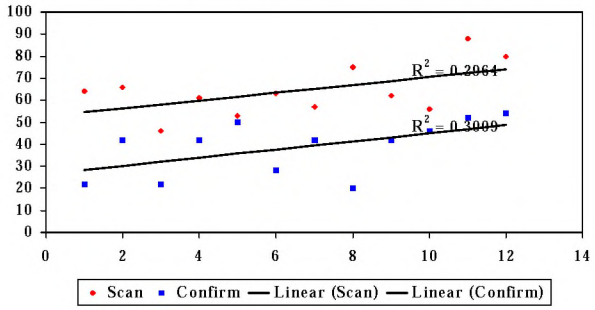


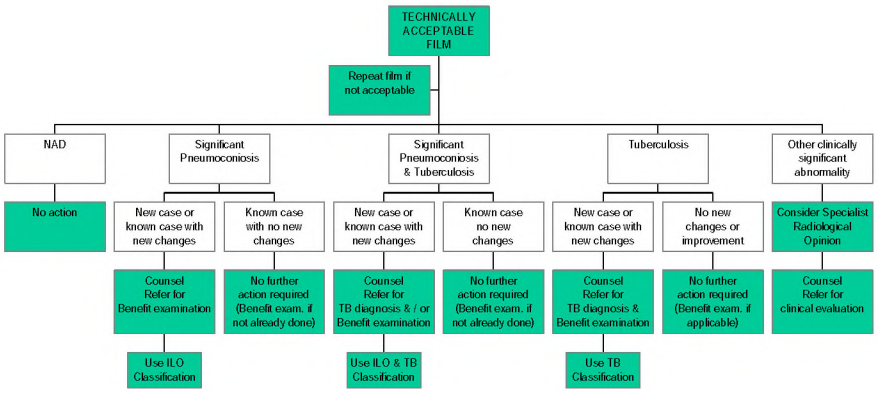

Figure 7.9: Participants' outcomes in the Confirmatory Exercise according to mining sector.



## Fig 7.10: Record of 12 evaluations by one participant.




## Figure 7.11: ROLDS revised classification.




New case is a case where a) the radiograph shows new changes; or b) no previous radiograph is available to antedate changes.

Known case is a case where the previous radiograph is available and shows an abnormality.

Table 7.3.2: Comparison of Groups 1 & 2 in the Scanning Exercise

| | Group1 | Group 2 ($p < 0.05$) |
|---|---|---|
| First Attempt | 58.4% (± 13.7%) n = 11 | 58.1%* (± 17.7%) n = 10 |
| Subsequent Attempts | 61.0% (± 8.1%) n = 3 | 74.2%* (± 16.5%) n = 10 |
| Total Attempts | 59.4% (± 12.6%) n = 14 | 66.2% (± 18.6%) n = 20 |

Table 7.3.3: Comparison of Groups 1 & 2 in the Confirmatory Exercise

| | Group1 | Group 2 |
|---|---|---|
| First Attempt | 43.3%<br>(± 12.6%)<br>n = 12 | 31.2%<br>(± 17.7%)<br>n = 10 |
| Subsequent Attempts | 43.2%<br>(± 8.1%)<br>n = 3 | 33.2%<br>(± 10.3%)<br>n = 10 |
| Total Attempts*<br>($p < 0.05$) | 43.2%*<br>(± 12.4%)<br>n = 17 | 32.2%*<br>(± 13.1%)<br>n = 20 |

Table 7.3.4: Range of results encountered in ROLDS exercises.

| | Lower Quartile | Median (Mean) | Upper Quartile |
|---|---|---|---|
| Scanning Exercise<br>(> 75%) | 54% | 62%<br>(63.4%) | 78% |
| Confirmatory Exercise<br>(> 50%) | 28% | 36%<br>(37.3%) | 48% |

## 7.4 Discussion.

The study had lower participation rates than initially hoped for, however sufficient responses have been received to make evaluate the product from Health 803 and make a comparison of Groups 1 and 2.

It is apparent from the evaluation that the ROLDS Simulation programme has certain attributes. Most important is that users can be shown to have a wide range of concordance with the expert interpretation of the films (the product can discriminate between candidates – not all do uniformly well or badly).

It Group 2, where sufficient repeat tests were returned, it could be shown that repeated use of the ROLDS Simulation programme results in better marks and therefore better concordance. Since this is ultimately the purpose of the programme, it is gratifying to have been able to demonstrate it in some measure.

There was no significant difference between Groups 1 & 2 in their proficiency in the Scanning exercise. Essentially this routine is for a separation of normal from abnormal films. In the more complex Confirmatory exercise, Group1 performed better than Group 2 and, in this instance, Group 2 did not improve their performance with a repeat exercises. This suggests that the product as Version 1.0 had not been as effective as the live symposium (with "hands on" training) at preparing participants for this more complex exercise.

Overall, the marks achieved by participants might seem lower than could have been expected. Participants are ROLDS practitioners and many of them have carried out ROLDS for many years or are reading large numbers of films on a regular basis. It is difficult to be sure of the reasons for relatively few participants achieving over 50% in Confirmatory exercises. One explanation could be the differences between digital and plate x-rays and participants' unfamiliarity with the former.

Another explanation could be participants' lack of familiarity with the use of the classification of films in this exercise. Although there are relatively few categories, participants may have failed to understand the necessity of interpolating the availability of a previous film or the clients' past certification history into the classification in order to result in an appropriate referral outcome. For example a film showing pneumoconiosis with no change from a previous film could be classified 2b – pneumoconiosis as before but, if that individual has not previously been certified as having pneumoconiosis, the correct answer should be 2a – pneumoconiosis new case, since this classification infers referral to the MBOD for a benefit examination, whereas 2b could result in no further action.

The classification used here was developed by the Faculty for this programme and is not one that is known to be in use anywhere. It is explained in the ROLDS symposium, lecture 19 and a hard copy summarising it was sent out to all participants with their CD. In the preparation of marking Scheme 2, there was ample opportunity to review participants use of the classification and it is concluded that it is simple, robust and appropriate. The only possible category that might be added is one to capture the concept of pneumoconiosis with evidence of apparent past tuberculosis where there seems to have been progression consistent with pneumoconiosis, rather

than tuberculosis. The category "pneumoconiosis and tuberculosis current" captures the concept of either a new case of silico-tuberculosis or a case of pneumoconiosis and tuberculosis where there has been progression thought consistent with tuberculosis.

Ultimately, the reasons for the range of marks achieved as encountered here cannot be explained by this study. There have never been any systematic external evaluations of ROLDS practitioners performed previously in South Africa for comparison. Few of the participants have had formal ROLDS training and even fewer have had access to a series of films classified by experts that they can view and interpret themselves and then see how well they agree. If the results of this study are really reflecting actual variations in proficiency in performing ROLDS, then that simply re-enforces the need for a programme of continuing profession development for ROLDS practitioners which was a purpose of Health 803.

In follow-up with participants the usual reason given for not yet having returned exercises was insufficient time – a complaint that many doctors have generally and one to which the author is very sympathetic. Less apparent, but also real, was the fact that some participants had found the software unfamiliar and occasionally apparently incompatible with their own PC systems. All technical problems associated with such apparent incompatibilities were resolved through a combination of email and telephone. A lack of computer literacy also seems to be playing a role in some instances. This is a problem of basic education that the study itself could not address at this point, although the problems that participants seem to have encountered will be addressed.

Another factor possibly contributing to low participation was the necessary imposition of a deadline for completion of exercises, following which the software provided would no longer work. This approach was necessary because of deadlines imposed by the research nature of Health 803, making it a one-year project. Deadlines were extended by sending out files that would refresh the software for a further period of two months once it was seen that participation was very low. Participants possibly also found this to be a challenge. It is anticipated that with long-lived software more participants will find the time to return exercises.

The main method used to encourage participation was through CPD points. All active participants in the study were sent CPD points reflecting the time they spent either on the ROLDS Symposium or Simulation, as reported by the files returned in the evaluations. It has been made clear to both active and non-active participants that this is a facility that will continue to be offered in 2003 and onwards. Participants were offered possible future invitation to a symposium on ROLDS and have been asked to declare whether they are interested in taking up this offer. An additional incentive that could continue to be offered is a book prize. In this round, a book prize "Occupational Lung Diseases: An International Perspective" was awarded to Dr Marguerite de Lange for best overall performance in a Scanning and a Confirmatory exercise.

Participants in both Groups have been asked to complete pro-forma evaluation sheets concerning the Symposium with open questions inviting comment about the ROLDS products and project. Although these returns have not been formally analysed here

they have been a useful form of communication with participants. The vast majority were positive and a number were explicitly congratulatory.

Suggestions by participants have included finding ways to shorten or summarise some of the lectures and increase their clarity. In particular, written transcripts of the lectures were suggested as a useful study aid. Group2 comments about the lecture series were varied – for example one participant stated that this was far preferable to lectures that left you with nothing a few months later, whilst another found recorded lectures more difficult to listen to at home than attending a lecture because extraneous comments by lecturers often made no sense out of context.

A larger series of pre-classified x-rays for viewing (as envisaged for Product 2) was suggested by a number of participants. These would enable users to practice classification for a Confirmatory exercise on a fairly large set of films (including both normal and abnormal) and to then compare their readings to those of expert readers. This could address the lack of "hands on" training in the more complex Confirmatory exercise that seems to be apparent from the product evaluation.

One participant had the view that repeated use of the programme could result in visual memorisation of particular films, rather than new skills in interpretation. This is a possibility and is a good reason for why Version 1.0 of the software should expire and why subsequent versions of the software should also expire. Participants should not be allowed to become overly familiar with the particular films in the various exercises. The number of these films must also be enlarged.

Two participants were explicit about their difficulty with finer decisions when it came to classifying certain types of films and gave explicit examples. One problem encountered was where there was a history of TB but the x-ray appeared normal. Should the film be classified as normal or TB as before? Another participant felt that the reporting of the administrative actions that classification implies should be kept separate since this sometimes confuses the issue of interpreting the film, for example in an obvious case of Pn where there is no change before, but the slide details indicate that Pn has not been diagnosed previously. The radiological diagnosis here would be 2b – Pn as before, whilst the correct administrative classification would be 2a – Pn new case since this infers administratively that the individual would be referred for a benefit examination in terms of the ODMWA. This is a useful and insightful suggestion.

In correspondence with participants, they have been asked to provide any classifications that they use in practice. A revised version of the classification (see figure 7.11) has been circulated amongst participants for comment.

# 8. Project interim report indicating deliverables, budgets and time frames.

DEPARTMENT OF MINERALS AND ENERGY
DETAILED SIMRAC PROJECT PROGRESS REPORT

(ONE UNBOUND COPY REQUIRED)

1 PROJECT NUMBER HEALTH 803

2 TITLE OF PROJECT

**Development and evaluation of guidelines and materials for the technology transfer of x-ray rea skills to medical practitioners in the mining industry.**

3 PRIMARY OUTPUTS

Survey of relevant current categories and training of x-ray reading for medical practitioners in the mining industry and the development of human resource guidelines
Identification of requirements from SIMRAC projects and other relevant sources for inclusion in training materials and suitable media for in-service training
Development of training materials for a screening level of competency
Pilot materials and methods by training and evaluating groups of medical practitioners
Revise and develop technology transfer guidelines and training materials which will be accredited by e.g. MQA, SAQA, SA Thoracic Society, SASOM and MMOA.

4 PROJECT LEADER **Professor Neil White**

5 ORGANISATION **Occupational Medicine Clinical Research Unit,**
**UCT Lung Institute**
**P.O. Box 34560**
**Groote Schuur 7937**

6 CONTRACT PERIOD 1 July 2001 – 31 June 2002

7 PERIOD OF REPORT Fifth Quarter

8 DATE 25 September 2002

## SUMMARY REPORT

### Summary of project progress during period under review (ten lines should suffice)

**July – September 2001**

Numerous meetings of participants, including stakeholders were held to plan and develop a curriculum for radiological occupational lung disease surveillance (ROLDS). A survey of x-ray reading practitioners was completed. Material required f deliverables was identified.

**August – December 2001**

Detailed planning of the formal Symposium on ROLDS took place. The survey of practitioners with an interest in ROLDS i mining industry identified 95 such practitioners. 12 were non-medical. The remaining 83 practitioners were invited to be participants in Health 803, using their email or fax as provided. 46 had responded by 14 December 2001and were randomise two groups of 23. The sub-contractor developing the software specifically required for Health 803 delivered early versions CR Rom based products. They still required refinement. 200 x-ray films had been captured digitally for use in the programm

**January – March 2002**

The formal Symposium on ROLDS took place on 15/16 February 2002, Four Ways Indaba, Gauteng. Faculty was Prof. N. V Ms E Le Roux, Prof R Glynn-Thomas, Prof A. Solomon, Prof H. Goodman, Dr J Murray, Dr K. Mashao and Dr L. Ndelu. 2 medical practitioners (Group 1) attended and were awarded CPD points. Eighteen presentations were given. These were cap as seven and a half hours of digital audio material and over 450 slides. Feedback from Faculty and attendees was highly posi with welcome suggestions for future improvements. Only the final afternoon of the symposium did not go according to plan had been the intention to use the time following the formal presentations to enable attendees to familiarise themselves with t software programme that was in development to enable participants to view films and report on them in an exercise that simu ROLDS. Unexpected problems were encountered both with the software and the computers that had been set up for this pur The session did enable feedback that will be useful in the final formatting of this programme. The software was developed f and all practical difficulties appeared to have been solved.

**April – June 2002**

The two software deliverables became available during April 2002. Product 1 was forwarded to Group 2, (21 participants) i 2002, following the MMOA Conference. Product 1 had an expiry date of 30 July 2002. Product 2 was forwarded to Group1 same time. Product 2 had an expiry date of 30 June 2002. To date 5/21 Group 1 participants and 1/21 Group2 participants ha returned completed exercises. Telephonic contact with Group 1 in the week 22 – 27 June revealed that 2 were not contactab email or telephone address as last given. 3 could not be contacted and reminder messages were left. 2 had experienced mino technical problems and 1 apparently major technical problem with the software. 3 pleaded insufficient time given and the remainder undertook to respond or had responded by 30 June. Those not responding by 30 June will either be sent email file extending Product 2's life until 30 July 2002 or a further CD-Rom. Responses to the products have been universally positive including from those who experienced minor technical problems. In conversation it is apparent that sub-groups exist in Grou ranging from those who have used the product without difficulty to those who seem less confident about the use of software/computers.

**July – September 2002**

Health 803 depends on voluntary participation and finalisation will depended on returns from participants. This factors delay the final report for Health 803 in its first year. Further renewal files were sent out and for this report a cut off date was set at September by which time there were 18 return had been received that could be evaluated. The results received and their use devising a second marking scheme are detailed in the final report. Products 1,2 and 3 are now available. The product is avail for distribution as Version 1.0 and can be demonstrated and distributed publicly.

Deviations from the programme budget or schedule: Final Report is 3 months late.

Note: A brief summary should be provided, describing and accounting for any significant deviations from the programme, budget or schedul enabling output/milestone level. Indicate clearly whether such deviations have already occurred, or whether they are planned to take plac future.

## Detailed Progress Report

Progress is to be reviewed in terms of achieving the planned outputs in accordance with the project plan. Authors should therefore state each those outputs below, as given in the accepted project proposal and indicate each completion date. Each output statement should then be foll by a concise description of progress during the reporting period, towards achieving the output. Any deviations from programme, budget or sc summarised on the preceding page, should be elaborated upon here. (Use continuation sheets as necessary.)

| Enabling Output No. | Contracted Completion Date | Statements of Output and Progress | Expe Com Date |
|---|---|---|---|
| 1 | Feb 2002 | Formal Training Symposium for medical Practitioners<br>Date 15/16 February 2002<br>Venue: Four Ways Indaba, Gauteng<br>Faculty: Prof. N. White, Ms E Le Roux, Prof R Glynn-Thomas, Prof A. Solomon, Prof H. Goodman, Dr J Murray, Dr K. Mashao, Dr L. Ndelu. Sound and slides captured as Product 1. Attendance: 23 medical practitioners with an interest in ROLDS related to the mining industry attended and earned CPD points.<br>Symposium arrangement: Ms Sally Elliot, UCT Conference Management Center.<br>Sound recording: On-line Inc. | 15/ Feb |
| 2 | Feb 2002 | CD Rom based self-evaluation and competency test software programme completed (Product 2). 280 x-rays are available for viewing in either a self test routine (where "correct" answers can be viewed) or an evaluation routine (where answers are sent in, either by email or disc). Films have been digitally copied and have accompanying medical and occupational histories. Various problems related to file format, size and security of these digital films have had to be addressed. Product 2 distribution to Group 1 begins in May 2002 with a product expiry date of 30 June 2002. | Apr 200 |
| 3 | March 2002 | CD Rom based training programme capturing the proceedings of the formal symposium (Product 1) is available and distribution begins in May 2002 for Group 2 who are also sent Product 2 which they are asked to complete before and after using the symposium. Their CD has an expiry date at the end of July 2002. | Apr 200 |
| 4 | June 2002 | Piloting materials and methods by training and evaluating groups of medical practitioners is well advanced. Although sufficient returns should have been received by the end of September 2002 for preliminary analysis, the definitive study must be left open for completion. | Sep 200 |

## INTERIM RESULTS

Product1, 2 and 3 Version 1.0 available for distribution.

## PUBLICATIONS

CD-Rom: ROLDS Training and Simulation, Version 1.0

# SIMRAC Project Health 803

## Provisional final statement: 18 December 2002

| | |
|---|---|
| Total contract amount for Health 803 | R864 000.00 |
| | |
| Income 10% start-up amount | R 86 410.00 |
| Income for first quarter July – September 2001 | R129 615.00 |
| Expenditure for first quarter July – September 2001 | R 69 260.52 |
| Income for second quarter October – December 2001 | R129 615.00 |
| Expenditure for second quarter October – December 2001 | R 97 237.48 |
| Income for third quarter December 2001 – March 2002 | R129 615.00 |
| Expenditure for third quarter December – March 2002 | R146 056.39 |
| Income for fourth quarter April – June 2002 | R129 615.00 |
| Expenditure for fourth quarter April – June 2002 | R175 231.37 |
| Expenditure for fifth quarter July – September 2002 | R 86 461.37 |
| Expenditure for sixth quarter Sept. – December 2002 | R 66 358.00 |
| | |
| **Total income** | **R604 870.00** |
| **Total expenditure** | **R640 605.13** |
| **Funds available** | **(-R35 735.13)** |

# 9. Conclusions and recommendations for future research.

Health 803 has been an exciting and varied process that has been an amalgam of research and development. The products developed during this project have the desired attributes, in that they are affordable to distribute, accessible, interactive and can be used for distance learning. As a permanent contribution to the development of professional standards for ROLDS the products are the most sophisticated developed thus far in South Africa and are at least on a par or superior to the distance learning materials made available by other universities or by NIOSH / ACR.

Health 803 has made it clear that professional development for ROLDS practitioners is both required and desired. Although participation by Groups 1 and 2 was possibly disappointing, it was abundantly clear, both from participants and those who might have wished to be participants, that training materials in this area were sought after. The wide scatter of results in the returned evaluations shows how necessary further training is. Early results of Health 803 suggest that viewing of series of films with expert interpretations can reduce this scatter and improve performance.

Further developments of the CD-Rom training products will increase their ease of use and access as well as increasing the depth of material contained. Health 803 has successfully begun a process of making CPD for ROLDS practitioners a permanent part of the post-graduate training possibilities for medical and other practitioners.

# APPENDIX 1: SOFTWARE SPECIFICATIONS FOR THE CD-ROM: ROLDS TRAINING AND SIMULATION.

## Product 1: ROLDS : The Symposium.

This section details the software requirements of Product 1: ROLDS: The Symposium for the contractors who are responsible for this aspect of Health 803.

### Introduction

Product 1 is a multimedia CD that uses Power Point 95 visual and MP3 audio files to reproduce each of the 19 lectures for medical practitioners detailed in Table 6.1.1.
The product had to be < 750 MB in total size (Actual size is about 300 MB).
The product had to be ready for testing before the end of November 2001.

### General Description

The product shall be user-friendly and reliable within a wide range of hardware and software platforms and computer literacy.
The product is intended to address problems of distance or Internet based learning and a paucity of high quality training materials in this field.
The product should use state of the art developments in interactive learning software.
The product requires Power Point 95 or later version to operate (an operating system that did not require the user to have Power Point or any other non-standard Windows programme was utilised).
The product will be compatible with and utilise the features of Windows 95, 98, Me, 2000, etc.
The product requires a home base system for tracking product numbers, receiving answers to questions at the end of lectures, marking those answers, tracking CPD points and other applications (Although this it is possible this specific option has not yet been added).

### Functional Requirements

The product should either be self-launching from a CD or it should be usable or downloadable from an Internet website.
The product will be installed into the Program files on windows and can be launched either from there or from a unique icon and short cut from the desktop. The system will have install and uninstall functions as is usual with Windows compatible systems.
The install function will check the system's hardware compatibility for use of the programme.
When launched the product will bring up a first screen that will prompt the user on optimal settings for resolution and viewing conditions. When this screen is exited, a second screen will appear.
The second screen will be front end of a data base. The user will given the option of entering or updating his or her first name, surname, title and HPCSA number. This information will be saved in a file on the user hard drive, and together with the email address and CD product number used will identify the user to Prof White in future communications.

The product will then display its main menu that will 1) list the lectures detailed in Table 6.1.1, together with the name of the author and their run time length; 2) enable the launch of products 2 or 3; 3) enable access to a library menu that will in turn access any text files stored on the CD; and 4) enable exit.
Clicking on a lecture will enable the user to choose to launch any one of the lectures detailed and will enable the user to keep a record of which presentations have already been viewed.
19 individual presentations detailed in 6.1.1 will each have a set of slides prepared in a Power Point 95 format presentation.
The first slide will name the presenter, his or her qualifications and affiliations and, if so desired a symbol or emblem of their affiliation, e.g. Wits, UCT, NCOH. This slide will show for approximately 15 seconds and will then automatically move on to the second slide.
With the second slide the audio (voice only) presentation will commence and will relate to that specific slide. (Difficulty has been encountered in finding an operating system that would do this as detailed here. At present the system requires the user to load all of the .MP3 files into the directory of their Windows media player and to start the lecture from there. This is clumsy and has given some users difficulty. The search is still on for a better system.)
The second and subsequent slides will include the information detailed in the lecture. Movement from slide to slide is controlled by an icon. Pressing on this icon will move on to the next slide and can interrupt the audio presentation. It should also be possible to move backwards through slides (and parts of the audio presentation).
The emphasis is on visual presentation and most Power Point slides will be illustrated. All illustrations will be in a JPEG format. Illustrations may be either a non-specific illustration, e.g. a pathology slide or a photograph illustrating a particular occupation; or chest x-rays.
Chest x-rays or HRCT scans to accompany specific presentations listed in 6.1.1 will be identified by Prof White and the presenter responsible. These films will be scanned for digital capture at maximum resolution as approx. 10 MB Dicom files. Subsequently they will be transferred to JPEG format at maximum resolution attainable on most PC screens (32 bit) and at with a byte size that will bring the product within the required overall size of the programme (<750MB ). Each presentation in 6.1.1 will be accompanied by approximately 6 – 8 illustrative films incorporated as Power Point slides. Some of these films may be illustrative details of a particular film, showing a particular area or feature in more detail. Details will be taken from maximum resolution views. In the presentation accompanying these illustrative x-rays, the presenter will frequently wish to draw attention to this area or feature by some means of highlighting such as a detail elipse or an arrow. There may be more than one area or feature on an x-ray or detail of an x-ray to be highlighted and digital space will need to be conserved in this process. (As detailed in 6.1.2 this process, which would have resulted in visual material of the highest possible standard, was not possible for the 35 mm slide presentations which were digitally copied and then made into Power Point slides).
A digital recording of each talk will be made and saved to an MP3 file. (At the outset it was not anticipated that each audio presentation would require at least some sound editing. A sound studio for recording was beyond our budget and it was widely agreed by Faculty that most speakers would require an audience to give their best performance. Editing was required to remove interruptions, extraneous noises, repetition, non-funny jokes and unfavourable allusions. It was required to ensure

continuity, particularly by adding sound prompts (in the lecturer's own voice) for slide changes. As published in Version 1.0 the sound track could still do with some further minor edits. Faculty have been asked to make their own suggestions.)
At the end of each lecture there will be three or four questions about that section. These will be in the form of multiple choice questions. The user can either skip back to the menu or proceed to answer the questions. After answering the questions the user will be returned to the main menu. (M.C.Q.'s or questions for a "most preferred answer" will be added in subsequent versions).
It should be possible to easily change or update the questions for a new edition of the CD.
After answering the questions, the answers will be stored in a file on the user computer's hard drive.
When the user next logs on to the internet this file will be sent to a web site or internet address to be identified by Prof White. At that address, the file will be opened. On receipt of any such communication, a number of events must be triggered.
Surname, first name, title, email address and product number will be compared with an existing excel database file in Prof White's possession. If the details correlate with an existing entry, the date of the communication will be entered into this file. If the details do not correlate with an existing file, then a welcoming email letter drafted by Prof White will be returned to the person which will be accompanied by an excel file questionnaire asking for demographic details. When the reply to this questionnaire is received, it will automatically update Prof White's database.
When the file is opened the answers to questions stored in the file will be compared against a file which contains the correct answers. A mark will be given for the percentage of correct answers. A letter containing this mark will be returned to the respondent.
Users who make the effort to answer questions will be qualifying for CPD points if they are medical practitioners. Details of those who qualify for CPD points must be entered on a database. This database will require to be audited annually so that the appropriate points are awarded.
The CD will have a folder with text files containing reference material. This folder will be accessed through the main menu and documents will be in a Microsoft Office 95 or later format or .pdf files.
The CD will either carry any software required to read and unzip it or will contain software instructions to download appropriate software from the internet.
The CD version's box front cover will have its title, mention that it is part of a series, should have an attractive thematic appearance, and acknowledge the primary contributors to the product. Other contributors will be acknowledged and necessary information included on inner leaf or back of CD. The CD itself will repeat the theme on the box. The icon for the programme will also repeat this theme.

**Interface requirements**

**User interfaces**

Requires and interacts with Microsoft Office 95 or more recent, and Windows 95 or more recent.
Menu and change slide icon enable easy navigation.
Communications with users are triggered through a website.
Details of users are updated through the website.

Accessed entirely through the internet or through a CD on a PC with an internet connection.
Software for digital voice recording to MP3 files to be identified.

**Hardware**

PC with a CD Rom, with or without Internet access.
Pentium I or better with 8 MB RAM, 125 MHz or better, CD Rom 8 x or better.
Hardware for digital voice recording to be identified.

**Other attributes**

Minimum maintenance of entire system
Easy serviceability
Periodic reports and updates anticipated.

**Preliminary schedule.**

All audio presentations to be recorded in February 2002.
All JPEG files to be available by early November 2001.
Alpha version available for testing by end November 2001.
Beta version available for use / distribution and field testing by 20 doctors, following February 2002.
Version 1.0 for distribution by March 2002.

**Product 2: ROLDS Simulation: Self-evaluation.**

This section details the software requirements specification of Product 2: ROLDS Simulation: The Self-evaluation (Product 2) for the contractors who are responsible for this aspect of Health 803.

**Introduction**

Product 2 uses a primarily visual multimedia CD with customised software that allows users to view series of x-rays from a user friendly screen.
The product must be < 1500 MB in total size (Currently about 80 MB).
The product should be ready for preliminary testing before the end of November 2001.

**General Description**

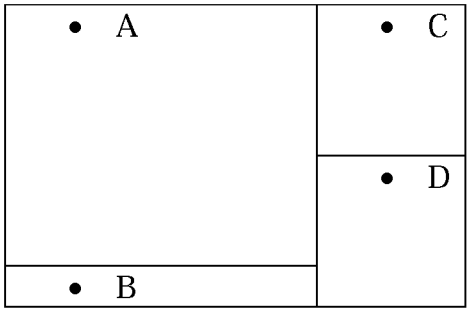
The product shall be user-friendly and reliable within a wide range of hardware and software platforms and computer literacy.
The product is intended to address problems of distance or Internet based learning and a paucity of high quality training materials in this field.
The product should use state of the art developments in interactive learning software.
The product will utilise customised software. Shareware near equivalents exist
The product will be compatible with and utilise the features of Windows 95, 98, Me, 2000, etc.

The objective of this product is to enable reading of two consecutive series of films in an interactive fashion.
This is a predominantly visual medium CD.
The product will be supported by home base hardware and software.

**Functional Requirements**

The product should either be self-launching or launched from the main menu of Product 1 or it should be usable or downloadable from an Internet website such as that of the University of Cape Town.
When launched the first screen will ask if the user wishes to perform an exercise for CPD points. If he/she answers yes the user will then be asked to enter his or her first name, surname and title, postal address and HPSCA number. This information will be saved in a file on the user hard drive, and together with the email address and Product number used will identify the user to Prof White in future communications. If the user answers no, this information will not be requested.
The second screen will advise the user on optimal settings for resolution and viewing conditions.
The third screen will ask for acceptance of the conditions of use the product.
The product will then display its main menu which will offer a choice of 1) an introduction to the product; 2) a series of choices about the films to be viewed; and 3) exit programme.
The CD will have a written introduction explaining its features and use. This section will have an audio accompaniment.
The prior test requirements of a series to be reviewed can be customised for the viewer's requirements. A menu will present these choices to the viewer. The first selection is for predominant exposure with three choices a) silica exposed; b) coal dust exposed; and c) tuberculosis only. (Not incorporated into Version 1.0) Any one of these selections will initiate selection of abnormal films from a particular series of abnormal films related to that exposure or abnormality. Notwithstanding the predominant exposure selected, a small and random proportion of other types of abnormalities will be selected for inclusion in the series. These will include technically unacceptable films, asbestos related pathologies (Not incorporated into Version 1.0) and other pathologies. The second selection is for pre-test probability of abnormality and will apply to the first of two routines for viewing of films that the software will initiate. The pre-test probabilities that can be chosen are: a) 2%, b) 5%, c) 10%; and d) 20%. (Not incorporated into Version 1.0) This choice will determine the proportions of normal and abnormal films that the software must add from the library to compile a series for viewing. Notwithstanding the choice of pre-test probabilities made, the actual number of abnormal films added to the series will vary by a small random factor. The choice of pre-test probability when taken with the silica or coal dust predominant exposure choice will select the proportion of films from a library showing simple or complicated pneumoconiosis. A random proportion of 5 – 15% of films from a library showing tuberculosis only will be further added to the series. The final selection will be for the number of films that the viewer wishes to scan. The choices offered will be a) 25, b) 50, c) 100 and d) 150. This choice will determine the total number of films in the first routine that the programme will initiate (Not incorporated into Version 1.0).

Selection of films from the library will be randomised such that any film in a particular section of the library, e,g. normal or silicotic films will have an equivalent chance of selection;.
When a series of films is presented, the ordering of normal and abnormal films will be randomised.
Once the pre-test requirements have been chosen the software must initiate two routines. The first routine is termed the scanning routine and the second routine is termed the confirmatory routine.
The scanning routine will comprise a series of films, with the number of films, pre-test abnormality rate and predominant exposure library used being determined by pre-selection choices made;
The confirmatory routine will be initiated once the scanning routine has been completed. The abnormal films for this routine will be selected predominantly from either the silica or coal dust folders according to the initial choice. Software will randomly select films so that 50 – 75% of films in the series are abnormal.
The computer screen, as seen either in the scanning and confirmatory routine will have four compartments divided as depicted below:




Compartment A will contain the chest x-ray being viewed. The size of this compartment will be maximised;
Compartment B will contain the control panel for viewing the chest x-ray. Controls in the panel will enable roving magnification of the film in compartment A through a panel that appears over Compartment C. The control panel will also enable calling up of the ILO standard films according to a menu similar to the ILO Short classification in Figure 1 above. The ILO film required will appear over compartment C. It will be possible to enable roving magnification of compartment C (Not incorporated into Version 1.0). The magnification panel will then appear over Compartment D, temporarily obscuring it.
Compartment C will contain accompanying details for the film. These details will be obscured when either the ILO standard films or a previous x-ray are called for (as in the confirmatory routine). This will comprise plausible values for age, occupation, exposure, length of service, previous history of tuberculosis (Yes/No), and prior certification of pneumoconiosis (Yes/No) taken from a database that relates to each film and is derived from the original findings. The term plausible is used because it is recognised that details such as these provide additional aids to remembering particular films. Therefore the software will have to enable plausible random variations in age and length of service by a few years and randomly insert No into the history when the actual answer is Yes.
Compartment D will be different for the scanning and confirmatory routines. In the scanning routine Compartment D will offer three choices: the film is a) unacceptable quality, or b) normal, or c) possibly abnormal for review. Accepting one of the

choices through the click of a mouse button on that choice will commit the choice to a database and call up the next film. In the confirmatory routine Compartment D offers the choices set out in Table 6.3.1 plus an additional choice to review a previous film. If a previous film is not available, this will be indicated. If a previous film is requested and is available, it will be displayed over Compartment C for a side-to side comparison roving magnification of the previous film will be enabled.
On completion of both scanning and confirmatory routines by the user, the software will provide the user with an analysis of results, indicating grades as detailed in 6.3.1. The software will enable a review of those films seen in both routines where there was a discrepancy between the reader and the answer for that film contained in the database. The answer that the reader gave will be displayed in Compartment D, whilst the result for the film in the database will be displayed in Compartment C.
It should be possible to easily change or update the films available for viewing in the various folders from time to time.
After performing the routines, the answers will be compared with a database on the CD containing the correct answers.
If the user has indicated that he/she wishes to perform the exercise for CPD purposes, when he/she next logs on to the internet a copy of the candidate's answers will be sent to a web site or internet address to be identified by Prof White. (This specification was not possible since files cannot be sent automatically. Instead participants had to be instructed on how to send the correct files.) At that address, the file will be opened.
On receipt of any such communication a number of events must be triggered.
Surname, first name, title email address and product unique number will be compared with an existing excel database file in Prof White's possession. If the details correlate with an existing entry, the date of the communication will be entered into this file. If the details do not correlate with an existing file, a welcoming email letter drafted by Prof White will be returned to the person which will be accompanied by an excel file questionnaire asking for demographic details. When the reply to this questionnaire is received, it will automatically update Prof White's database. (These are functions that have to be performed and cannot be done automatically)
When the file is opened, the answers to questions stored in the file will be compared against a file that contains the correct answers.
A mark will be given for the agreement on the presence/absence of abnormalities as detailed below. A letter containing this mark will be returned to the respondent.
Users who make the effort to answer questions will be qualifying for CPD points if they are medical practitioners. Details of those who qualify for CPD points must be entered on a database. This database will require to be audited annually so that the appropriate points are awarded.
All files of copies of x-ray films will be initially scanned at a maximal (about 9MB) resolution. Subsequent file size of films as actually used will depend on limitations such as the number of films required per disk and resolution of best available PC screens.
The software required for the scanning and confirmatory exercises must have the following operating features:
Simple in operation.;
Accesses a library /folders of files of films and data about films;
The library will have folders of the following types of images: a) normal films, b) abnormal silica exposed, c) abnormal coal dust exposed, d) abnormal asbestos exposed, e) other abnormalities, f) technically defective films, and g) ILO standard films (Not to be distributed with the CD since the ILO holds the copyright for these

films. An Internet address for viewing the NIOSH digital copies of the ILO Standard films will be provided on the CD).
The CD will contain a database with essential information to accompany each film:
Assembles series of films for reading routines with their accompanying information for reading based on this library and database; and
Enables assembly of a uniquely ordered series of films each time it is used.
Once a series of films has been selected for reading as a series, this series could be downloaded to a folder on the user's hard drive, if this will speed the process of viewing. On completing reading a series of films by the user, the files should be deleted from this folder.
The Product will either carry any software required to read it, unzip it or will contain software instructions to download appropriate software from the internet.
The CD version's box front cover will have its title, mention that it is part of a series, should have an attractive thematic appearance, and acknowledges the primary contributors to the product. Other contributors will be acknowledged and necessary information included on inner leaf or back of CD. The CD itself will repeat the theme on the box.

**Interface requirements**

**User interfaces**

Requires and interacts with Microsoft Office 95 or more recent, and Windows 95 or more recent.
Menus, control panel and icons will enable easy navigation.
Communications with users are triggered through a website.
Details of users are updated.
Accessed entirely through the Internet, through a CD on a PC with an internet connection or on a PC with no internet connection. (Thus far only a CD version has been developed).

**Hardware**

PC with a CD Rom with or without Internet access.
Pentium I or better with 16 MB RAM, 125 MHz or better, CD Rom 8 x or better. (In fact the product is marginal at this level and needs a bit better than this)
The product can utilise up to 200 MB of hard disk space but should offer larger or smaller installation hard disk space requirements.

**Other attributes**

Minimum maintenance of entire system
Easy serviceability
Periodic reports and updates anticipated.

**Preliminary schedule.**

Alpha version available for testing by end November 2001.
Beta version available for use / distribution and field testing by 20 doctors in early February 2002. (Only achieved in May 2002).

## Product 3: ROLDS: External evaluation.

This section details the software requirements specification of Product 3: ROLDS Simulation: External evaluation for the contractors who are responsible for this aspect of Health 803.

### Introduction

Product 3 uses the customised software developed for product 2, allowing users to view series of x-rays from a user friendly screen. In this instance the software requires further development to enable an internet based examination system.
The exam CD must be < 750 MB in total size (Currently 80 MB).
The product should be ready for testing before the end of November 2001.

### General Description

The product shall be user-friendly and reliable within a wide range of hardware and software platforms and computer literacy.
The product is intended to address problems of distance or Internet based learning and a paucity of high quality training materials in this field.
The product should use state of the art developments in interactive learning software.
The product will be compatible with and utilise the features of Windows 95, 98, Me, 2000, etc.
Product 3 will utilise software on the user's PC that has already been installed for Products 1 or 2.
Exam CDs will be part of an easily sustained internet linked system for producing unique CD based exams, receiving answers and providing results.
Every exam CD produced will have a unique number that will link it to its contents, correct answers and to whom it has been given (not incorporated in developing Version 1.0 where limited numbers with limited shelf life were provided to known recipients).

### Functional Requirements

The product should either be self-launching or launched from the main menu of Product 1, or it should be usable from an Internet website such as that of the University of Cape Town.
The system will have install and uninstall functions as is usual with Windows compatible systems. The install function will check the system's hardware compatibility for use of the programme, particularly the presence of previously loaded software. It should only be possible to do a particular exam once, and certainly only once on a particular computer.
When launched the product's first screen will ask if the user to accepts the conditions under which he or she is performing an examination for certification purposes. The user will be advised that he/she should set aside sufficient time for the exercise.

If he/she answers yes, the user will then be asked to enter his or her first name, surname, title and HPCSA Registration number. This information will be saved in a file on the user hard drive, and together with the email address used will identify the user to Prof White in future communications. If the user answers no, this information will not be requested and the programme will abort.
The product will then display a screen advising the user on optimal settings for PC screen resolution and ask whether the user is ready to start. At answer no, the programme will ask again periodically until it aborts. Time taken for the exercise will be recorded from the yes point and entered into the users' file. The product will then call up the scanning exercise screen, as developed for product 2 and commence the test as described above.

A. Scanning exercise (weight = 50)

The candidate will review 50 films
There are 5 – 15% abnormal/unacceptable films in the series.
Films should be classified as normal or abnormal.
Candidates will be evaluated for agreement on presence/absence of abnormality (with one mark for each correct answer in Scheme 1).

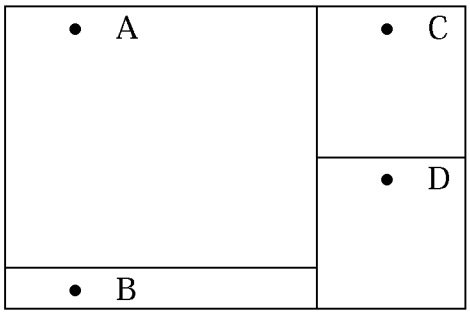
B. Confirmatory exercise (weight = 50)

The candidate reviews 25 films
There are approximately 20 abnormal/unacceptable films in the series, plus 15 previous films.
Films must be classified according to the system used in Table 6.3.1 2 points are awarded for each x-ray correctly allocated to one of the seven categories identified in table 6.3.1 (in marking Scheme 1).

There will be no time limit although time will be recorded to establish norms.

All files of copies of x-ray films will be initially scanned at a maximal (about 9MB) resolution. For the Product 3 films byte size will be maximised and kept as close to 9 MB as possible.
To achieve this objective Product 3 will utilise software that has already been loaded either with Product 1 or Product 2 and will not necessarily be operable without the software from these products having first been installed.
Film files for the exercise will be called up from two separate folders – one each for the scanning and confirmatory exercises.
There will be a data base for the accompanying details of each film: age, exposure and length of time, previous tuberculosis and certification.
For each film in the confirmatory exercise there will be the option of asking to look at a previous film. The option of asking for a previous film will appear in the control panel and will only be available in the confirmatory exercise. When no previous film is available this will be signalled. The previous film, when available will appear in screen compartment C.
Access to these folders and files, other than through following the menu should not be possible. (Files are all encrypted in Version 1.0)
Product 3 film folders and files will be assembled from an archive of films established on a hard drive nominated by Prof White. The software required for organisation of

this archive and assembling of product 3 film folders must have the following operating features:
Simple in operation;
Accesses a library /folders of files of films and data about films;
The library will have folders of the following types of images: a) normal films, b) abnormal silica exposed, c) abnormal coal dust exposed, d) abnormal asbestos exposed, e) other abnormalities, f) technically defective films, and g) ILO standard films.
The archive will contain a database with essential information to accompany each film.
Assembles series of films for reading exams with their accompanying information according to an algorithm developed with Prof White.
Enables assembly of a unique exam on order;
The prior test requirements of a series to be reviewed can customised according to the examiners' requirements. A menu will present these choices to the examiner. The first selection is for predominant exposure with four choices a) mixed b) silica exposed; c) coal dust exposed; and d) tuberculosis only. (Not incorporated into Version 1.0) Any one of these selections will initiate selection of abnormal films from a particular series of abnormal films related to that exposure or abnormality. Notwithstanding the predominant exposure selected a small and random proportion of other types of abnormalities will be selected for inclusion in the series. These will include technically unacceptable films, asbestos related pathologies and other pathologies. The second selection is for pre-test probability of abnormality and will apply to the first of two routines for viewing of films that the software will initiate. The pre-test probabilities that can be chosen for the scanning exercise are on a continuous scale from 2 to 40%. For the confirmatory exercise the pre-test probabilities that can be chosen are are on a scale 50 to 100%. This choice will determine the proportions of normal and abnormal films that the software must add from the library to compile a series for an exam.
Selection of films from the library will be randomised such that any film in a particular section of the library, e,g. normal or silicotic films will have an equivalent chance of selection;
When a series of films is presented to the candidate the ordering of normal and abnormal/unacceptable films will be randomised;
Once the scanning routine has been initiated the candidate should proceed through to the confirmatory routine without interruption. If the candidate attempts to exit or close the programme, or switches off the computer a warning should appear that if the candidate exits it will not be possible to re-commence the exam until a new exam is available. This should be in the conditions of the exam.
The computer screen, as with Product 2 will have four compartments divided as depicted below:



Compartment A will contain the chest x-ray being viewed. The size of this compartment will be maximised;
Compartment B will contain the control panel for viewing the chest x-ray. Controls in the panel will enable roving magnification of the film in compartment A or any films called into panel C through a panel that appears over Compartment C but can be moved to appear over panel A. It will not be possible to activate the control to see a film in negative when doing an exam.
The control panel will also enable calling up of the ILO standard films according to a menu similar to the ILO Short classification in Figure 1 above. The ILO film required will appear over compartment C. It will be possible to enable roving magnification of compartment C. To enable viewing of the ILO standard films they may have to already have been loaded on the users' hard drive.
Compartment C will contain accompanying details for the film. These details will be obscured when either the ILO standard films or a previous x-ray are called for (as in the confirmatory routine) This will comprise plausible values for age, occupation, exposure, length of service, previous history of tuberculosis (Yes/No), and prior certification of pneumoconiosis (Yes/No) taken from a database that relates to each film and is derived from the original findings. The term plausible is used because it is recognised that details such as these provide additional aids to remembering particular films. Therefore the software will have to enable plausible random variations in age and length of service by a few years and randomly insert No into the history when the actual answer is Yes.
Compartment D will be different for the scanning and confirmatory routines. In the scanning routine Compartment D will offer three choices: the film is a) unacceptable quality, or b) normal, or c) possibly abnormal for review. Accepting one of the choices through the click of a mouse button on that choice will commit the choice to a database and call up the next film. In the confirmatory routine Compartment D offers the choices set out in Table 6.3.1 plus an additional choice to review a previous film. If a previous film is not available this will be indicated. If a previous film is requested and is available it will be displayed over Compartment C for a side-to side comparison roving magnification of the previous film will be enabled.
On completion of both scanning and confirmatory routines the software will provide the user with an analysis of results, indicating gradings as detailed in 6.3.1. The software will enable a review of those films seen in both routines where there was a discrepancy between the reader and the answer for that film contained in the database. The answer that the reader gave will be displayed in Compartment D, whilst the result for the film in the database will be displayed in Compartment C.
After performing the routines, the answers will be stored in a file on the user computer's hard drive.
The user should then be prompted to either log on to the Internet or to insert a stiffy disk into the A drive. This file will then be sent to a web site or Internet address to be identified by Prof White. Alternatively the file will be saved to the hard disk and handed to or posted to Prof White. When the file is received via the internet or entered via the A drive the file will be opened. (This process actually requires sending multiple files, each of which must be attached to an email or saved to a disk if the exercise is to be evaluated).
Surname, first name, title, email address and HPSCA number will be compared with an existing excel database file in Prof White's possession. If the details correlate with an existing entry the date of the communication will be entered into this file. If the

details contain the HPSCA details for the first time, these details will be updated in the database.
When the file is opened the answers to questions stored in the file will be compared against information on the hard drive archive which contains the correct answers for the films listed as appearing in this CD.
A mark will be given for the agreement on the presence/absence of abnormalities in the scanning exercise. The mark for confirmatory exercise is apportioned as 2 marks for each of the 25 films correctly classified in the confirmatory exercise.
An email letter containing marks will be returned to the respondent and a copy will be printed for posting
Back-up copies of all software programmes will be made available for the possible event of hard disk failure.
Facilities for regular, automatic and verifiable back-up of all forms of stored data to be in place.
The CD version's box front cover will have its title, mention that it is part of a series, should have an attractive thematic appearance, and acknowledges the primary contributors to the product. Other contributors acknowledged and necessary information included on inner leaf or back of CD. The CD itself will repeat the theme on the box.

**Interface requirements**

**User interfaces**

Requires and interacts with Microsoft Office 95 or more recent, and Windows 95 or more recent.
Menus, control panel and icons will enable easy navigation. User interface as for Product 2 now for secure examination purposes.
Communications with users are triggered through a website.
Examiner able to easily generate new exams through menus and random selection of films.
Details of users are updated through the website.
Accessed or used entirely through the internet, through a CD on a PC with an internet connection or on a PC with no internet connection.

**Hardware**

PC with a CD Rom with or without Internet access.
Pentium I or better with 16 MB RAM, 125 MHz or better, CD Rom 8 x or better.
The product can utilise up to 200 MB of hard disk space but should offer larger or smaller installation hard disk space requirements.

**Other attributes**

Minimum maintenance of entire system
Easy serviceability
Periodic reports and updates anticipated.

**Preliminary schedule.**

Alpha version available for testing by end November 2001.
Beta version available for use / distribution and field testing by 20 doctors in early February 2002.
Final version for distribution by March 2002. (Actually sent out in May 2002)

# APPENDIX 2: COMMUNICATIONS WITH PARTICIPANTS IN HEALTH 803.

Communication with participants in Health 803 was an important aspect of the study, beginning with informing ROLDS practitioners about the existence of the project, obtaining their informed consent for randomisation and participation in the study and then keeping them informed about developments. At the conclusion of the project all active participants were also sent a CPD certificate reflecting the time they had spent using the product, together with a certificate indicating their best mark achieved in a Scanning or a Confirmatory exercise. These various communications with participants are included in this appendix for completeness of the project description.

**Professor Neil White**
MD, FCP (SA), MFOM (UK)
**Occupational Medicine Clinical Research Unit**
**U.C.T. Lung Institute**
St George's St, Mowbray
P.O. Box 34560, Groote Schuur 7937

Tel: 021-4066850
Fax: 021-4066851
nwhite@uctgsh1.uct.ac.za

29 November 2001

Dear Colleague

**RE: INVITATION TO PARTICIPATE IN A STUDY OF TRAINING METHODS AND MATERIALS FOR RADIOLOGICAL OCCUPATIONAL LUNG DISEASE SURVEILLANCE APPROPRIATE TO THE S.A. MINING INDUSTRY.**

Health 803 is a SIMRAC project concerned with screening or surveillance radiology for occupational lung diseases occurring amongst people employed in the South African mining industry. The project aims to make a permanent difference to standards of radiological occupational lung disease surveillance (ROLDS) through the development of training methods and materials. The materials will be appropriate, affordable and accessible. In particular the needs for distance learning are being taken into account.

I thank you for your participation in the telephonic survey conducted by Mrs Pam Rabie during July – October this year. You were identified as a medical practitioner associated with ROLDS and the mining industry. You indicated your interest in further participation in this project.

You are now cordially invited to be a participant in the part of Health 803 in which training methods and materials will be evaluated. The protocol for this study is detailed in a second attachment for your information.

You should notify me **before 14 December 2001** that you wish to be a participant in Health 803. Interest in participation in this project is considerably greater than the optimal class size (20 – 25). For this reason and for reasons outlined in the protocol attachment a random selection will be made and participants will either be offered free attendance at a two day symposium to be held in Fourways, Gauteng 15/16 February 2002, or an equivalent CD Rom Self Directed Learning programme and a possible opportunity to attend a second symposium later in 2002.

You may accept this invitation by simple return of Fax or email message. For further information you can consult the attachments or contact me directly.

**Professor Neil White**
MD, FCP (SA), MFOM (UK)
**Occupational Medicine Clinical Research Unit**
**U.C.T. Lung Institute**
St George's St, Mowbray
P.O. Box 34560, Groote Schuur 7937

Tel: 021-4066850
Fax: 021-4066851
nwhite@uctgsh1.uct.ac.za

**November 2001**

## Protocol: A comparison of a traditional symposium and distance learning as preparation for skills evaluations for readers in Radiological Occupational Lung Disease Surveillance.

Health 803 is a SIMRAC project concerned with screening or surveillance radiology for occupational lung diseases occurring amongst people employed in the South African mining industry. The project aims to make a permanent difference to standards of radiological occupational lung disease surveillance (ROLDS) through:

- Development of a curriculum outlining the knowledge base for ROLDS.
- Development of training methods and materials that will cover the curriculum. The materials will be appropriate, affordable and accessible. In particular the needs for distance learning need to be taken into account.
- Development of self-training and self-evaluation routines for ROLDS.
- Evaluation of training methods and materials.

A variety of training methods and materials will be developed for this project. One product is a formal two-day training symposium on ROLDS, the other is a CD Rom-based self-directed training programme which essentially captures all of the main presentations at the symposium. This study will compare the outcome of two groups of medical practitioners' performances in an equivalent skills evaluation exercise following exposure to a formal training symposium only (Group 1) vs a CD Rom-based self-directed training only (Group 2). Both groups will also receive a CD Rom-based training routine that simulates ROLDS and contains over 150 x-rays.

The hypothesis being tested in this study is that there is no difference between Group 1 and Group 2 in the performance of the same self-evaluation exercise where the primary outcome measured is percent in a test.

**Study design and participation**: a study of the outcomes in evaluations of two groups of medical doctors in a skills evaluation process for radiological surveillance appropriate to the South African mining industry. Eighty-three potential candidates for the study have been identified by a systematic telephonic survey. All potential candidates identified will be invited to participate in the study. Those accepting conditions for participation will be randomised (taking into account the operational requirements of their services) to either Group 1 or Group 2. Group 1 will attend a

formal training symposium in February 2002 during which a self-evaluation exercise will be performed. Group 2 will be sent a CD Rom based self-directed training course and CD Rom based self-evaluation exercise. Candidates in Group 2 who complete the self-evaluation exercise will be invited to attend a further formal training symposium to be held in late 2002 or early 2003.

**Sample size and statistical power:** a telephonic survey conducted by Mrs Pam Rabie in July – October 2001 identified 95 practitioners associated with ROLDS in the SA mining industry, of whom 83 were medical practitioners. If participants accept randomisation and are randomised to either group 1 or 2 by an accepted procedure the required sample size of candidates completing a self-evaluation to detect a mean difference in scores of 5% between the groups is 16. With a sample size of 25 completing the self-evaluation in each group a 5% difference in mean scores in the groups would be detected with 94% power. Without randomisation there can be no meaningful statistical comparisons, given the available numbers.

**Randomisation:** Participants will be randomised subsequent to accepting their invitation to participate. Each participant will be assigned a number. A random number table will be used to select 25 potential participants for Group 1. These potential participants will all be invited. If any member of Group 1 subsequently indicates an inability to attend because of operational requirements of their practices a further participant will be randomly selected from the original list.

Although randomisation is the fairest way in which to allocate a limited number of places in the February 2002 symposium, it may result in an inequitable distribution of invitations (e.g. no person from a large group practice is invited). If it is apparent or it is drawn to the attention of the investigators that randomisation has resulted in such an effect, further invitations of attendance at the February 2002 symposium may be extended.

**Implications of Participation:**

**Group 1:** All participants in this group will be invited to a two-day symposium on Radiological Surveillance for Occupational Lung Disease (as applied to the SA mining industry). The symposium will be held at the Indaba Hotel at Fourways, Gauteng on Friday 15 th (commencing at 9.30 a.m.) and continuing from 8.30 am until the afternoon, Saturday 16 th February 2001. The faculty at this symposium will include Prof. N. White (pulmonologist and project leader), Prof. A. Solomon, Prof. R. Glynn-Thomas, Prof. H. Goodman, Dr K. Mashao (radiologists), Dr. J. Murray (pathologist) and Ms E LeRoux (radiographer). Attendance at the symposium will be free of charge. Participants are required to meet their own costs for travel, accommodation and breakfast. Accommodation is available at the Four Ways Hotel and participants will be assisted with making bookings. Meals, other than breakfast will be provided. Gauteng participants are asked to seriously consider staying overnight, to make the early start on the Saturday. During the symposium participants will be asked to perform a CD-Rom based self-evaluation exercise. It is planned to provide each participant with an alpha training version of this exercise prior to attending the symposium, in order that they have an opportunity to become familiar with the programme.

Group 2: Participants randomised to this group, may prior to February 2001 still be randomly invited to become a part of Group 1 if there are any drop-outs from Group 1 prior to the symposium. Subsequently participants in this group will be sent a CD-Rom based version of the same symposium attended by Group 1 in the form of a self-directed learning programme. They will also be sent a CD-Rom based self-directed training programme that simulates surveillance radiology together with a self-evaluation exercise based on this programme. Participants will be able to submit the results of this self-evaluation exercises via the internet or on disk. Participants will be followed up to encourage their full participation. Participants who submit the results of a self-evaluation exercise will be invited to attend a similar two-day symposium on Radiological Surveillance for Occupational Lung Disease (as applied to the SA mining industry) that will be held in late 2002 or early 2003, contingent on continuation funding being available from SIMRAC. Similar conditions will apply as at the February 2002 symposium.

**Measurements made**: demographic and other details of 83 eligible participants are already known. One group of subjects will be invited to attend a one-day training symposium, the second group will receive a CD-Rom-based programme and will be asked to perform an equivalent self evaluation exercise.

Grading in evaluations as outlined in 5 above will be available from each reader' s performance in each phase of the evaluation. The primary outcome of interest is percentage obtained in an evaluation.

**Risks:** lack of interest among practitioners for the project may result in small numbers for comparisons. This will be countered by making materials as accessible and convenient to use as possible. Randomisation may be perceived negatively, however it may be the fairest manner across the mining industry in which to allocate limited places (25) to the formal training programme. Participants in Group 2 might feel they have had a poor deal and thereafter be disinterested in the self-directed training CD product. This will be countered by holding a second formal training in late 2002 or early 2003. Continuation funding for this purpose has been applied for from SIMRAC. This would mean that those randomised to self-directed training only would have time to use the product before formal training and if they submitted a self-evaluation exercise they could gain free entry to the second formal training session.

**Benefits:** participants in both groups will receive CPD points for attending or time spent working on the CD. All participants achieving the desired grade in the evaluation process will be given a certificate to this effect.

**Ethical considerations:** all analyses of participants' outcomes will be confidential and such that individual participants can in no way be identified. Individual outcomes in evaluations will only be made known to the individual concerned. The only exception may be that the name of the person(s) achieving best overall scorings be publicised.

**Outcome:** analyses of participants' outcomes, together with their evaluations of the various training products will be part of the final report of Health 803.

**Professor Neil White**
MD, FCP (SA), MFOM (UK)
**Occupational Medicine Clinical Research Unit**
**U.C.T. Lung Institute**
St George's St, Mowbray
P.O. Box 34560, Groote Schuur 7937

Tel: 021-4066850
Fax: 021-4066851
nwhite@uctgsh1.uct.ac.za

18 December 2001

Dear Colleague

**RE: INVITATION TO PARTICIPATE IN A STUDY OF TRAINING METHODS AND MATERIALS FOR RADIOLOGICAL OCCUPATIONAL LUNG DISEASE SURVEILLANCE APPROPRIATE TO THE S.A. MINING INDUSTRY.**

Thank you for your acceptance of my invitation to participate in SIMRAC project Health 803 to develop training methods and materials for ROLDS. Your name was randomised together with then names of xx other practitioner who accepted my invitation. You have been assigned to Group 1. Consequently:

You are offered free attendance at a two day symposium concerned with ROLDS to be held in Fourways, Gauteng 15/16 February 2002, as detailed in my original invitation.

The UCT Conference Management Centre, who will be arranging the symposium will be in contact with you soon concerning accommodation and other details.

**If you are no longer able to attend the symposium, please let me know as soon as possible, in order that an alternate can be invited.**

**Yours sincerely**

**Professor Neil White**
**MD, FCP (SA), MFOM (UK)**
**Project leader: Health 803**

**Professor Neil White**
MD, FCP (SA), MFOM (UK)
**Occupational Medicine Clinical Research Unit**
**U.C.T. Lung Institute**
St George's St, Mowbray
P.O. Box 34560, Groote Schuur 7937

Tel: 021-4066850
Fax: 021-4066851
nwhite@uctgsh1.uct.ac.za

18 December 2001

Dear Colleague

**RE: INVITATION TO PARTICIPATE IN A STUDY OF TRAINING METHODS AND MATERIALS FOR RADIOLOGICAL OCCUPATIONAL LUNG DISEASE SURVEILLANCE APPROPRIATE TO THE S.A. MINING INDUSTRY.**

Thank you for your acceptance of my invitation to participate in SIMRAC project Health 803 to develop training methods and materials for ROLDS. Your name was randomised together with then names of xx other practitioner who accepted my invitation. You have been assigned to Group 2. Consequently:

**You will be provided, free of charge, a CD-Rom based self-directed learning course on ROLDS during March or April 2002. You are asked to complete a self-evaluation subsequent to this. I will correspond with you further about this.**

If you return a self-evaluation, and SIMRAC continuation funds permitting, you will be offered free attendance at a symposium on ROLDS to be held in 2003. If there are any drop-outs from Group 1 prior to 15/16 February 2002, there is the possibility that members of Group 2 could be invited to attend the ROLDS symposium to be held on that date.

**Yours sincerely**

**Professor Neil White**
**MD, FCP (SA), MFOM (UK)**
**Project leader: Health 803**

**Professor Neil White**
MD, FCP (SA), MFOM (UK)
**Occupational Medicine Clinical Research Unit**
**U.C.T. Lung Institute**
St George's St, Mowbray
P.O. Box 34560, Groote Schuur 7937

Tel: 021-4066850
Fax: 021-4066851

24 May 2002

Dear Colleague

**RE: PARTICIPATION IN A STUDY OF TRAINING METHODS AND MATERIALS FOR RADIOLOGICAL OCCUPATIONAL LUNG DISEASE SURVEILLANCE (ROLDS) APPROPRIATE TO THE S.A. MINING INDUSTRY.**

In line with your participation in SIMRAC project Health 803 I am enclosing a CD Rom containing a software programme designed to simulate ROLDS. Participants in Group 1 were introduced to an earlier version of this programme at the ROLDS symposium held at 4 Ways Indaba in February 2002. I am confident that you will find this version robust and easy to use. Files containing written instructions can be found in the programme and give detailed printable instructions if you require them.

As a participant in the study I am asking you to install this programme on a suitable PC, enrol as directed and complete the exercises on it. This version is in development and you will encounter warnings concerning whether you wish to run the programme from its current location (which you do want) and the absence of an authenticode signature which should not concern you.

In the shorter "self-test" exercises you will have the opportunity to familiarise yourself with the software, review your own performance, view the "correct" answers and write me comments about films. The question of "correct" answers will be addressed in future versions of the software and your participation in the project is an essential part of doing this properly. It may interest you to know that my own performance in the exercises is regularly in the range 75 – 85%, despite the fact that I have seen these films repeatedly, so please do not be discouraged because you seem to be getting "incorrect" answers. In the longer evaluation exercise you will not get immediate feedback but you are asked to send me your answers either by disc or email as is detailed in the instructions. A complimentary disc is enclosed.

Because this product is in development I have elected to include an expiry date in this Version 1.0. Therefore you are asked to complete at least one full evaluation exercise and return it to me **before 30 June 2002**, following which date this programme will expire. You may use the exercise up to 25 times and may send me your answers for multiple evaluations if you so wish.

Please note that CPD points will be awarded for submission of a completed evaluation exercise. On further development of this product you will receive a free version of both this programme and another which will enable you to revise from all of the talks and slides that were presented at the 4 Ways Indaba Symposium. Your participation in this programme as a practicing reader of miners' chest x-rays is very important and greatly appreciated by me. Your readings and comments on the films in the database will contribute to the future use of the database in training and evaluation.

Finally, I attach a copy of the classification of films for use in the Confirmatory Exercise in the ROLDS simulation for your easy reference. Also included on the CD is my lecture and slide presentation which will explain the use of this classification in the ROLDS simulation exercise. The audio presentation for this lecture is an .MP3 file which can be accessed by a wide variety of software programmes, including WINAMP, a compressed .zip file version of which is available on the CD. To listen to this audio presentation your computer must obviously have a sound card and speakers.

If you encounter difficulties in the use of this software please contact me.

Yours sincerely

**Professor Neil White**
**UCT Lung Institute**

**Professor Neil White**
MD, FCP (SA), MFOM (UK)
**Occupational Medicine Clinical Research Unit**
**U.C.T. Lung Institute**
St George's St, Mowbray
P.O. Box 34560, Groote Schuur 7937

Tel: 021-4066850
Fax: 021-4066851
nwhite@uctgsh1.uct.ac.za

**23 April 2002**

**Dear Colleague**

## Update: A comparison of a traditional symposium and distance learning as preparation for skills evaluations for readers in Radiological Occupational Lung Disease Surveillance.

Thank you once again for being a participant in this SIMRAC funded project that is developing training and evaluation materials promoting surveillance radiology for occupational lung diseases occurring amongst people employed in the South African mining industry. You have been assigned to either of two groups in this project.

**GROUP 1:** attended a symposium on ROLDS in February 2002. They are now asked to make use of the ROLDS simulation package that has been developed.

**GROUP 2:** The proceedings from that symposium have been captured, edited and are now ready for distribution to Group 2. Group 2 will be asked to make use of both the training and simulation programmes on his package.

Distribution of these products will commence on 3 May 2002 at the Mine Medical Officers Association Annual Congress at the Malaga Hotel, Mpumalanga. I will have a stand at the Congress demonstration the products and will have appropriate copies of software available for distribution. Please approach me for your copy. For participants not attending the Congress your copies will be sent out subsequently.

If your contact details have changed, please update me.

Yours sincerely

Professor Neil White

**Professor Neil White**
MD, FCP (SA), MFOM (UK)
**Occupational Medicine Clinical Research Unit**
**U.C.T. Lung Institute**
St George's St, Mowbray
P.O. Box 34560, Groote Schuur 7937

Tel: 021-4066850
Fax: 021-4066851

24 May 2002

Dear Colleague

**RE: PARTICIPATION IN A STUDY OF TRAINING METHODS AND MATERIALS FOR RADIOLOGICAL OCCUPATIONAL LUNG DISEASE SURVEILLANCE (ROLDS) APPROPRIATE TO THE S.A. MINING INDUSTRY.**

In line with your participation as a member of Group 2 in SIMRAC project Health 803 I am enclosing a CD Rom containing a software programme designed to simulate ROLDS and a "virtual symposium" with slide and audio files that reproduce a symposium held at 4 Ways Indaba in February 2002. Please read this letter carefully as this will facilitate your correct and frustration free participation in the project.

This is the first version of this product and its operation may require some experimentation from you to get optimal performance from the product. Laboratory tests show that it does work! Future versions will be improved and your participation is an important part of this process. As a participant in the study I am asking you to install this programme on a suitable PC and enrol as directed. This version is in development and you will encounter warnings concerning whether you with to run the programme from its current location (which you do want) and the absence of an authenticode signature which should not concern you.

The CD contains two main parts - the symposium, and the simulation. You are asked to approach these two parts of the CD Rom in the following steps:

## Step 1 – a "before" evaluation.

In the first instance you are asked to complete at least one full exercise in the ROLDS simulation programme. In the simulation programme you will be given the opportunity to view and classify a series of chest x-rays of South African gold and coal miners. Written instructions are available in the software explaining how to do this and Lecture 19 in the lecture series (by myself) explains this with accompanying slides. When you do these exercises you are asked to complete at least one full cycle of self-test (12 films) and evaluation (75 films) exercises. You do not need to send these back to me yet – you will do that later.

In the shorter "self-test" exercises you will have the opportunity to familiarise yourself with the software, review your own performance, view the "correct" answers

and write me comments about films. The question of "correct" answers will be addressed in future versions of the software and your participation in the project is an essential part of doing this properly. It may interest you to know that my own performance in the exercises is regularly in the range 75 – 85%, despite the fact that I have seen these films repeatedly, so please do not be discouraged because you seem to be getting "incorrect" answers.

## Step 2 – making use of the "virtual symposium."

This CD-Rom contains 7 hours of audio files and more than 400 slides illustrating aspects of ROLDS. Talks vary in length from 12 to about 40 minutes and contain presentations by some of South Africa's leading authorities in this field. Lecture 1 is an introduction to the series and use of this software. Simultaneous audio and slide viewing requires your computer to have a sound card and speakers and for you to identify and listen to the correct lecture which is in an .MP3 file. This is done using a media player programme such as WINAMP (a zipped version of which is available on the CD). Accessing the .MP3 files will require you to load the C:/ROLDS/audio files into the WINAMP play directory. Written instructions on how to do this simple operation are present in the software. If you are still having difficulty with the sound files, ask a teenager because the .MP3 file format is well known to teenagers since this is the format for music files that can be downloaded from the internet. MP3 files are very compact and this has enabled us to fit 7 hours of audio time on to one CD.

All of the lectures in the symposium are in the same audio and slide format and you will be in control of both the audio (e.g. you can pause the lecturer) and moving slides along on the "next slide" prompt from the lecturer. You can pause to study visual material for longer and get the lecturer to repeat until you are satisfied you have heard! Study of these lectures can qualify you for up to 12 Clinical CPD points, pro-rata for the time spent on them. The software will track your use of the programme in order that requirements for the awarding of CPD points are met.

## Step 3 – the "after" evaluation.

Following use of the lecture programme to your satisfaction I ask that you complete at least one further series of evaluation exercises using the ROLDS simulation programme. Having completed at least one "after" evaluation you are then asked to send me your answers (this will include automatically generated time sheets) either by disc or by email as the programme instructs you. A complimentary disc is included.

Because this product is in development I have elected to include an expiry date in this Version 1.0. Therefore you are asked to complete your initial use of the product and send to me at least two full evaluation exercises before **31 July 2002**, following which date this programme will expire. Extensions will be granted but I will be extremely grateful if you could have completed your participation by this date.

Please note that CPD points will also be awarded for submission of completed evaluation exercises. On further development of this product you will receive a free copy of the second edition of this product.

Also included with this letter is a paper copy of the classification of films that is used in the Confirmatory Exercise in the ROLDS simulation programme. This is for your easy reference.

Finally, I include a paper form for you to use to provide me with written feedback on each of the lectures and your impressions of this product overall. This should be posted back to me.

Although the exercise may initially seem complicated I think that you will find this product to be a uniquely useful way of promoting your professional ability to undertake ROLDS. Your participation in this programme is greatly appreciated and will contribute to improved future versions. If you encounter difficulties in the use of this software please contact me.

Yours sincerely

**Professor Neil White**
**UCT Lung Institute**

7 December 2002

Dear Colleague

**RE: SIMRAC HEALTH 803/ROLDS**

I write to thank you for your willingness to participate in this project. The final report of the first round of this project has been submitted to SIMRAC. A summary of the outcome of this trial is attached for your interest and information. A full and final report of the project will be published on the SIMRAC website when finalized. The whole process of research and development involved in Health 803 would not have been possible without your individual willingness to participate and give of your time.

I am especially appreciative of the many useful comments I have had concerning the aims and methods involved in this project from participants. They will all help to make this product a more rewarding and engaging learning exercise.

For those participants who where kind enough to return radiological reading exercises, I attach a report detailing your best result in a scanning and a confirmatory exercise. Your results are compared to the range encountered in the use of version 1.0 of the ROLDS simulation. CPD points for your time spent in the exercise will be accredited to you by the University of Cape Town, Faculty of Health Sciences Office of CPD Accreditation, to a maximum of 10 for use of the ROLDS Symposium and 10 points for use of the ROLDS simulation.

I would like to congratulate Dr Marguerita de Lange, for attaining the highest marks overall. She has been given a copy of "Occupational Lung Disease: An International Perspective": Edited by Daniel Banks and John Parker.

For those of you who are less happy with the outcome of your evaluations, I hope that you will make use of the second version of the product to work to improving your level of agreement with the original expert readers of the films. Lack of familiarity with the digital medium for viewing x-rays and the x-ray classification used in the exercises are possible reasons for some participants below average performance in evaluations.

A revised classification is proposed as detailed in the attachment. This will be used in version 2.0 of the product. I would be most appreciative of any comments on this classification and would happy to look at methods of record keeping and classification used by any of the participants in their practices. The new classification will be

hierarchical and will have fewer choices than the previous classification in the first instance. In the confirmatory exercise you will be asked to classify a film as either technically inadequate, normal, significant pneumoconiosis and tuberculosis, tuberculosis or other abnormality. If you indicate one of the three occupational lung diseases, you will in each instance be given three further choices, i.e. a new case, a known case with new changes or a known case with no new changes. Additionally, if you so wish, you will be able to use the ILO classification for a film.

If you were a participant in this project and were not able to return a radiological reading exercise to me, please understand that I am sympathetic to problems that people encountered in using this product. Doctors are very busy people and unfamiliarity with the software or even incompatibilities may have been barriers to easy use of the first version of the product.

Version 2.0 of the product will be available early in 2003. It will be easier to use, valid for a year and contain many more training films. A copy will be sent to you when it becomes available.

An order form is enclosed for anybody you know of who might want to make use of the CD: ROLDS Training and Simulation, version 2.0.

In August 2003 I am planning to organize a further symposium dedicated to ROLDS training. This 2 day symposium will be very similar in scope and content to the material covered on the CD Rom, but in addition will have a Faculty of Radiologists and other experts available for 'hands on' training.

All 24 participants in the study who have already made returns are eligible for invitation to attend this symposium, free of charge. As a participant in this study you can still qualify for this, if you return a reading exercise to me reasonably early in 2003. I hope that many of you will take the opportunity to do this and that those of you who have already made returns take the opportunity to try and better your outcomes.

Yours sincerely

**Professor Neil White**
**MD (UCT), FCP (SA), MFOM (UK)**
**Pulmonologist**

# Radiological Occupational Lung Disease Surveillance

# 2002

**XXX**

performed evaluation exercises utilising the CD-Rom ROLDS: Training and Simulation, Version 1.0.

Highest percentage of correct answers achieved:

| Scanning exercise | Confirmatory exercise |
|---|---|
| **x** | **x** |

Range of results for 70 exercises returned in 2002:

| | Scanning exercise | Confirmatory exercise |
|---|---|---|
| Lower quartile | 54% | 28% |
| Median<br>(Mean) | 62%<br>(63.4%) | 36%<br>(37.3%) |
| Upper quartile | 78% | 48% |

CPD points are accredited separately.

Professor Neil White
MD (UCT), FCP (SA), MFOM (UK)
Director, Occupational Medicine Clinical Research Unit

CONTINUING PROFESSSIONAL DEVELOPMENT CERTIFICATE

# Radiological Occupational Lung Disease Surveillance

## 2002

**XXX**

**HPCSA No.: MP**

performed interactive distance learning exercises utilising the CD-Rom ROLDS: Training and Simulation, Version 1.0.

For use of the ROLDS Symposium:

Category 3 Clinical Points

For use of the ROLDS Simulation:

Category 3 Clinical Points

HPSCA Accreditation Number A001/501/11/2002.

Professor Neil White
MD (UCT), FCP (SA), MFOM (UK)
Director, Occupational Medicine Clinical Research Unit
Department of Medicine, University of Cape Town.

# APPENDIX 3: ORDER FORM FOR THE CD-ROM PRODUCT.

## ORDER FORM

## RADIOLOGICAL OCCUPATIONAL LUNG DISEASE SURVEILANCE (ROLDS)

To order a copy of the ROLDS Training and Simulation CD-Rom Version 2.0 (2003), please complete this form:

20. Title (Prof, Dr, Mr, Mrs, Ms, Miss) and Christian name or initials

21. Surname

22. Postal address, including postal code.

23. Telephone number.
24. Fax
25. e-mail address

Price: R200 for practitioners not associated with the SA mining industry

Send order forms to:

**OCCUPATIONAL MEDICINE CLINICAL RESEARCH UNIT**

**U.C.T. Lung Institute**

**PO Box 34560**

**Groote Schuur 7937**

**In order for us to maintain and update a database of ROLDS practitioners you are also asked to provide the following information. This information may qualify you for a reduced price or free CD-Rom.**

26. Category of radiological surveillance performed:

    a) primary reader
    b) secondary / specialist / referral reader
    c) administrative responsibility for the surveillance programme
    d) a combination of the above

27. Number of surveillance chest radiographs reviewed per week.

    a) 1-20
    b) 20-50
    c) 50-100
    d) 100-200
    e) 200-500
    f) > 500

28. Approximate proportions of large film : MMR plates reviewed per week

    a) 100 % large
    b) > 80 % large but < 100 %
    c) > 50 % large but < 80 %
    d) > 20 % large but < 50 %
    e) > 1 % large but < 20 %
    f) 100 % MMR

29. Mining company(ies) for which these services are performed. Please list only the name of the most important company (for numbers of x-rays reviewed) and the number of other companies for which services are provided.

30. Non-mining company(ies) for which these services are performed. Please list only the name of the most important company (for numbers of x-rays reviewed) and the number of other companies for which services are provided.

31. What is the sector of this company, if it is a mining company?.(tick one: gold/ coal/ platinum/ diamonds/ base metals/ quarrying/ other).

32. Category of health professional (tick one)

    a) medical practitioner
    b) nurse
    c) radiographer
    d) other (please specify)

33. Year of first attaining a professionally registerable health qualification:

34. In the case of medical practitioners, please indicate any post-graduate qualifications (and year):
    a) DOH or equivalent
    b) specialist radiologist
    c) other (please specify)
    d) none

35. In the case of other categories of health professionals, please indicate any relevant post-qualification training.
    a) DOH or equivalent
    b) in-service
    c) other (please specify)
    d) none

Today's date:

THANK YOU FOR COMPLETING THIS QUESTIONNAIRE

## APPENDIX 4: ROLDS FACULTY CONTACT DETAILS.

The enthusiasm and professionalism with which the Faculty took up the project and contributed to it is acknowledged and warmly appreciated.


Prof Neil White
Occupational Medicine Clinical Research Unit
U.C.T. Lung Institute
St George's St, Mowbray
P.O. Box 34560, Groote Schuur 7937
Tel: 021-4066850
Fax: 021-4066851
Cel.:082-9225517
nwhite@uctgsh1.uct.ac.za

Ms Elmien LeRoux
Harmony Hospital, p/B X36, Virginia
49 Zomba St, Doorn, Welkom
Tel: 082-940 6371
Email:EleRoux@Harmony.co.za

Prof Hillel Goodman
Department of Radiology
UCT Health Sciences Faculty
Groote Schuur Hospital
Groote Schuur 7925
Tel: 021 4044200

Prof Ray Glynn-Thomas
Department of Radiology
Witwatersrand University Medical School
Eaton Rd. Parktown 8001
Tel: 011-784 0404 (Home)
Cel.:083-3088194

Prof Albert Solomon
Occupational Medicine Clinic
National Centre for Occupational Health
106 Joubert St Extension,
Johannesburg 2000.
Tel:011-7126400
Email:SolomA@health.gov.za

Dr Jill Murray
Pathology Department
National Centre for Occupational Health
106 Joubert St Extension,
Johannesburg 2000.
Tel:011-7126400
Email:Murraj@health.gov.za

Dr Khanyakude Mashao
Radiology Department
Lesedi Clinic
Baragwanath Rd, Diepkloof
Tel: 011-9381012
Cel.:082-8227007

Dr Lindiwe Ndelu.
Director, Medical Bureau for Occupational Diseases
De Korte St,
Braamfontein, Johannesburg
Tel:011-4031350 or 4036322
ndelul@health.gov.za