

Curtin University of Technology
School of Pharmacy

Adverse Drug Reaction Reporting in Australian Hospitals

Yunita Nita

This thesis is presented as part of the requirements for
the award of the Degree of Master of Pharmacy of
the Curtin University of Technology

May 2002

ACKNOWLEDGMENTS

I wish to thank my supervisor, Dr Kevin T Batty, for his assistance, guidance and support throughout the research period. Also thank you for all the constructive comments and patience during the course of this study. To my associate supervisor, Mr Richard J Plumridge, thank you for all your assistance.

Thank you to Dr John McEwen and the Secretariat of the Adverse Drug Reactions Advisory Committee for reviewing the questionnaire and endorsing the survey.

To Ms Jennifer Lalor, thank you for your assistance and technical expertise in SPSS data programming and analysis. Thanks to Dr Ritu Gupta for your help with the General Linear Model. To Ms Rhonda Clifford, thank you for your help with the grammar editing.

Thank you also goes to the Society of Hospital Pharmacists of Australia (SHPA) for providing me with the list of the hospitals and pharmacists.

Sincere thanks to all the medical records staff in Fremantle Hospital and Health Services who helped me with the penicillin data collection.

Thank you to Mr Graham Swan (Sir Charles Gairdner Hospital), Ms Trish Parry (Albany Regional Hospital), Ms Helen Hunter (Geraldton Regional Hospital) and Mr John Dickson and Mr Ron Monson (Port Hedland Regional hospital) for their support to the survey.

This study could not have been carried out without the participation of the chief of pharmacists, doctors and pharmacists who responded to the survey.

Financial support was gratefully received from AusAid. To Ms Deborah Pyatt, thank you for all your support.

Thanks to all my friends who helped and supported me throughout the study period.

Lastly, but not leastly, I wish to thank my parents, Mr Soerjono Seto and Mrs Juniar Soerjono, and my sisters, Mira and Ana, for their personal support and understanding; starting from the scholarship application until finishing this thesis. *Terima kasih atas segala dorongan semangat dan doanya sehingga tugas akhir ini dapat terselesaikan.*

DECLARATION

I certify that no portion of the work described in this thesis has been submitted in support of an application for another degree or qualification of this or any other university or other institute of learning. To the best of my knowledge the document does not contain any material previously published or written by another person except where due reference is made in the text.

Yunita Nita

May 2002

TABLE OF CONTENTS

Acknowledgments	ii
Declaration	iii
Table of Contents	iv
List of Tables	vii
List of Figures	x
Abstract	1
Introduction	3
1.1. Definition and Classification	3
1.2. Background.....	4
1.3. Detection of ADRs.....	7
1.4. ADR Reporting Scheme in Australia.....	8
1.5. ADR Reporting Systems in Australian Hospitals.....	10
1.5.1. The Spontaneous Reporting System.....	11
1.5.2. The Notification System	11
1.5.3. The Completed Chart Check-Off System	12
1.5.4. The Chart Scanning System	13
1.5.5. The Intensive Drug Monitoring Studies.....	13
1.5.6. The Active Seeking of ADRs System	14
1.6. ADR Reporting System Other than Australian Hospital	15
1.7. Survey of the Hospital Pharmacy Departments Involvement in ADRs Reporting	18
1.8. Knowledge and Attitudes of Hospital Pharmacists and Doctors Toward ADR Reporting.....	20
1.9. Penicillin Allergy.....	25

1.10. Cross-Sensitivity between Penicillin and Other β -Lactam Antibiotics	27
1.11. Objectives	29
Research Methodology	30
2.1. Adverse Drug Reaction Reporting Survey	30
2.1.1. Ethics Approval and Confidentiality	30
2.1.2. Study Design.....	31
2.1.3. Questionnaire Development.....	31
2.1.4. Sampling and Data Collection	33
2.1.5. Pilot Study.....	35
2.1.6. Data Entry and Statistical Analysis	35
2.2. Audit Report in Penicillin Allergy.....	36
2.2.1. Study Design.....	36
2.2.2. Sample Size.....	36
2.2.3. Ethics	36
2.2.4. Confidentiality	37
2.2.5. Data Collection.....	37
2.2.6. Inclusion and Exclusion Criteria	37
2.2.7. Statistical Analysis	38
Results and Discussion	39
3.1. Survey of the Adverse Drug Reaction Reporting Systems in Australian Hospitals.....	39
3.1.1. Response Rate	39
3.1.2. Demographic Data	41
3.1.3. Written ADR Reporting Policy	42
3.1.4. Factors Associated with the Existence of the ADR Reporting Policy	43
3.1.5. Drugs Targeted	44
3.1.6. Documentation of ADRs.....	45
3.1.7. Active Screening of the Suspected ADRs	47
3.1.8. Personnel Involved in ADR Reporting	48
3.1.9. Pharmacy Department's Involvement in Hospital's ADRs Reporting System.....	49
3.1.10. ADR Reports to ADRAAC in 2000	50

3.1.11. Follow Up Action	52
3.1.12. Prevention Action	52
3.1.13. Information Regarding the Occurrence of ADRs Given to Patient, General Practitioner and Community Pharmacist	53
3.1.14. Feedback and Reward for Reporting ADRs.....	55
3.1.15. Factors Associated with Reporting Rates	56
3.1.16. Comments for Improving ADR Reporting	59
3.2. Adverse Drug Reaction Reporting Surveys to Doctors and Hospital Pharmacists	61
3.2.1. Response Rates	61
3.2.2. Demographic Data	63
3.2.3. Knowledge and Attitudes Toward ADR Reporting	66
3.2.4. Personnel Involved in ADR Reporting	69
3.2.5. ADR Reports to ADRAC in 2000	71
3.2.6. The Availability of the ADR 'Blue Card'	73
3.2.7. Compensation for ADR Reporting	75
3.2.8. Factors that would Encourage ADR Reporting	76
3.2.9. Factor that would Discourage ADRs Reporting	78
3.2.10. ADR Hypothetical Questions	79
3.3. Retrospective Audit of Penicillin Allergy	84
3.3.1. Incidence of Cross-sensitivity between Penicillin and Other β - lactam Antibiotics	86
Conclusions	89
References	91
Appendices	97
Appendix 1: ADRAC 'Blue Card'	97
Appendix 2: Ethics Approval	100
Appendix 3: ADRAC Endorsement Letter.....	105
Appendix 4: Questionnaires	107
Appendix 5: Cover Letter	122
Appendix 6: Data Collection Form (Penicillin).....	127

LIST OF TABLES

Table 1.1	Summary of factors which encourages doctors or pharmacists to report ADRs to the appropriate body. Result were obtained from various published studies and are presented as a percentage of agreement from the respondents.....	21
Table 1.2	Summary of factors which would deter doctors or pharmacists from reporting ADRs to the appropriate body. Results were obtained from various published studies, and are presented as a percentage of agreement from respondents.....	23
Table 3.1	Responses from each state obtained from chief pharmacists responding to the ADR reporting system survey in Australian hospital.....	40
Table 3.2	Hospitals demography.....	41
Table 3.3	Descriptive statistics of hospitals responding to the survey to chief pharmacists.....	42
Table 3.4	Factors associated with the existence of ADR reporting policy in hospitals and in pharmacy departments	44
Table 3.5	Documentation of ADR reports in hospitals and pharmacy departments	46
Table 3.6	Active methods of identification of the suspected ADR	47
Table 3.7	Health professionals responsible for the notification of ADRs when it first becomes apparent and who were encouraged to report ADRs either to hospital or to ADRAC according to chief pharmacist respondents	48
Table 3.8	Number of ADR reports submitted to ADRAC in 2000 according to chief pharmacist from each hospital	50
Table 3.9	Comparison of ADRs submissions to ADRAC in 2000 obtained from chief pharmacist and from ADRAC	51

Table 3.10	Information regarding of the incidence of ADRs.....	53
Table 3.11	Summary of feedback and rewards for reporting ADRs in hospital	55
Table 3.12	Factors associated with ADR reporting rate obtained from ADR reports submitted to ADRAC in 2000.....	56
Table 3.13	Gender of doctor respondents	63
Table 3.14	Years registered and practice in hospital of doctor respondents.....	63
Table 3.15	Gender of hospital pharmacist respondents	65
Table 3.16	Years registered and years of practice in hospital of hospital pharmacist respondents	65
Table 3.17	Knowledge of hospital pharmacist and doctor respondents in how to report ADR within the hospital and to ADRAC	67
Table 3.18	The ADR information and the type of information given during the commencement of employment in hospital to respondents.....	67
Table 3.19	Respondents' opinion of the adequacy of the ADR reporting system established in their hospital	69
Table 3.20	Personnel who should be responsible for documenting ADR reports in the hospital and submitting ADR reports to ADRAC.....	70
Table 3.21	ADR reports submitted to ADRAC in 2000. The number were the number of reports stated by doctors and hospital pharmacists	72
Table 3.22	Doctors' and hospital pharmacists' knowledge in the availability of ADRAC 'blue cards' in hospital. Respondents may answer more than one source.....	73
Table 3.23	Doctors' and hospital pharmacists' knowledge in where the ADRAC 'blue card' can be found. Respondents may answer more than one source.	74
Table 3.24	Compensation given for reporting ADRs in the hospital.....	75
Table 3.25	Factors that would encourage respondents to report ADRs within the hospital and to ADRAC.....	76
Table 3.26	Factors that would discourage respondents to report ADRs within the hospital and to ADRAC.....	78
Table 3.27	Responses from respondents for the ADR hypothetical questions. Respondents had been asked to indicate which reactions they would report.	80
Table 3.28	Number of hypothetical ADRs the respondents would like to report.....	82

Table 3.29 Demographic data of patients experiencing penicillin allergy during admission or causing admission in Fremantle Hospital and Health Services (FHHS) between 1994-January 2001.....	84
Table 3.30 Patients experiencing penicillin allergy during admission or causing admission in Fremantle Hospital and Health Services (FHHS) between 1994-January 2001	85
Table 3.31 Incidence of reported allergy to other β -lactam antibiotics, in patients allergic to penicillin during admission or causing admission in Fremantle Hospital and Health Services (FHHS) between 1994-January 2001. Possible allergy was classified as lack of definitive documentation in patients' medical records.....	87
Table 3.32 Antibiotic therapy prescribed in place of penicillin for patients with documented penicillin allergy in Fremantle Hospital and Health Services (FHHS) between 1994-January 2001.....	88

LIST OF FIGURES

Figure 3.1 Current area of practice in hospital of doctor respondents	64
Figure 3.2 The status of doctor respondents	64
Figure 3.1 Main activities in hospital of hospital pharmacist respondents	66

ABSTRACT

Adverse drug reactions (ADRs) are known to be a major cause of morbidity and mortality. However, only a small proportion are reported. An increase in the number and quality of reports by improving ADR reporting systems in hospitals, could improve patient outcomes and save healthcare costs.

The first part of this project was to review the ADR reporting systems in Australian hospitals and to determine factors contributing to the ADR reporting rate. Data were collected by a postal, self-administered questionnaire. Questionnaires were sent to 299 chief pharmacists of Australian hospitals listed in the Society of Hospital Pharmacists of Australia (SHPA) directory. The response rate was 49.5%. Seventy seven (60%) hospitals had a formal hospital policy for ADR reporting and 110 (85.3%) hospitals targeted all drugs to be reported. ADR reporting rates to ADRAC in 2000 (ADR reports per patient admission) were between zero and 1.09% (median=0.02%) with 7.1% of hospitals having a reporting rate of zero. A centralised ADR system and the existence of an ADR policy was not associated with higher reporting rates.

The next part of the project was a survey of 803 Western Australian (WA) doctors and 1323 Australian hospital pharmacists to evaluate involvement in, understanding of and reasons for reporting ADRs. A postal, self-administered, anonymous questionnaire was sent to doctors at two tertiary hospitals in Perth and three regional hospitals in WA. A similar questionnaire was sent to all hospital pharmacists listed in the membership list of SHPA, as well as non-SHPA members in WA. Response rates obtained for the WA doctors survey was 35% (n=277) and 43% (n=574) for hospital pharmacists. Sixty four percent of doctors and 96% of hospital pharmacists knew how to report ADRs within the hospital while 57% and 98% (respectively) knew how to report ADRs to ADRAC. Factors that would

encourage respondents to report ADRs included serious reactions, unusual reactions, reaction to a new product and confidence in the diagnosis of the ADR. More than 70% of respondents agreed that an uncertain association between the ADR and the suspected drug, minor reactions and well known reactions were factors that would deter them from reporting ADRs. From a list of 14 hypothetical ADR questions, it was found that respondents were more likely to report serious and uncommon reactions.

Finally, the incidence of cross-sensitivity between penicillin and other β -lactam antibiotics among patients experiencing penicillin allergy in Fremantle Hospital and Health Services (FHHS) was assessed, along with the appropriate documentation of penicillin allergy in the medical records. The study was a retrospective audit and review of medical records in FHHS (1994-2000). All medical records of patients experiencing penicillin allergy during admission, or causing admission to FHHS, (n=85) were reviewed and data on reactions to other β -lactams were recorded. The incidence of definite cross-sensitivity between penicillins and cephalosporins was 6%, consistent with the reported rate of cross-sensitivity. The documentation of penicillin allergy in the medical records was less than optimal, with alerts on 89% of medication charts and only 28% of medical records (front cover). Improvement in the documentation of ADRs in patients' medical records would likely decrease the risk of preventable adverse events.

CHAPTER 1 INTRODUCTION

1.1. Definition and Classification

The World Health Organization (WHO) defines an adverse drug reaction (ADR) as “A response to a drug that is noxious and unintended and occurs at doses normally used in man for the prophylaxis, diagnosis or therapy of disease, or for modification of physiological function”.¹

Rawlin and Thompson² classify ADRs as type A, augmented and type B, bizarre; this classification has been widely utilised in the literature. Type A reactions result from an exaggeration of a normal pharmacological property of a drug within usual therapeutic doses. They are predictable from the pharmacological and toxicological properties of the drug, usually dose dependent and normally have a high incidence of morbidity, and low mortality.² An example of a Type A reaction is bradycardia with β -adrenoceptor antagonists.² Type A reactions tend to be less severe and are dose dependant, and are more likely to be detected before a drug is marketed.³ Type B reactions are qualitatively abnormal and unrelated to the pharmacology of the drug. They are unpredictable and are usually not observed during pharmacological and toxicological screening programs and may be life threatening.² Examples include malignant hyperthermia of anaesthesia and acute porphyria.² Type B reactions have a relatively high mortality, and are often not detected before marketing.³

1.2. Background

ADRs are known to be a major cause of patient morbidity and mortality. A recent study in the United States (US), listed ADRs as the fourth to sixth leading cause of death in the US in 1994.⁴ There was a wide variation in the estimated incidence of ADRs.^{1,5,6} These wide variations may be due to:^{1,5-7}

- ◆ Different study methods
- ◆ Methods of causality assessment
- ◆ Definition of ADRs
- ◆ The type of hospital
- ◆ The hospital admission policy
- ◆ The country of the study
- ◆ Whether the incidence was defined as ADRs causing hospital admission or developed during hospital admission

It has been estimated that ADRs contribute 2-6% of hospital admissions.^{1,2,6,8,9} Furthermore, 10-20% of hospital inpatients are estimated to experience ADRs.^{2,4,6,10}

Lazarou *et al*⁴ carried out a meta-analysis of 39 prospective studies from the US over a period of 32 years to estimate the incidence of confirmed serious and fatal ADRs in hospitalised patients. The study excluded errors in drug administration, non-compliance, overdose, abuse, and possible ADRs. They utilised the ADR definition according to the WHO and excluded studies which did not follow the definition. The incidence of ADRs in the hospital and the incidence of ADRs leading to hospitalisation were combined to obtain an overall incidence of ADRs in hospitalised patients. They found that 6.7% (95% CI, 5.2% - 8.2%) of the ADRs reviewed were considered serious and 0.32% (95% CI, 0.23%-0.41%) were fatal. They also estimated that in 1994, approximately 3 million hospital inpatients experienced ADRs of which approximately 700 000 were serious. Approximately 100 000 were fatal. In an accompanying editorial, Bates¹¹ suggested that the incidence reported by Lazarou might be over-estimated. The study employed the accepted criteria for meta-analysis, however the combination of small heterogeneous studies did not necessarily reflect the true population. It was also

possible that the hospitals were not representative of the hospitals at large as they were mostly academic, tertiary hospitals which tend to treat sicker patients.¹¹ However, Bates suggested that even if the true ADRs incidence was lower than what Lazarou *et al*⁴ had found, the problem of ADRs incidence was greater than generally considered.¹¹

Roughead¹² examined drug related hospitalisation in Australia based on a review of current data available in Australia:

- ◆ The Australian National Hospital Morbidity Collection (produced by Australian Institute of Health and Welfare, cited by Roughead¹²)
- ◆ The Quality in Australian Health Care Study¹³
- ◆ Australian study assessing drug related hospital admissions¹⁴

The Australian National Hospital Morbidity Collection is a collection of coding records of hospital admissions in Australia. Hospital admissions associated with ADRs were reviewed.¹² It was found that of 22 825 hospital admissions associated with ADRs in 1992-1993, only 11% to 31% were reported.¹² It is not clear why the range of reported ADRs was wide and to whom it was reported. The wide range of reports is probably due to the broad type of hospitals included in the database; some were tertiary hospitals and others were secondary or specialised hospitals. Furthermore, the author stated that there was underreporting and ambiguities of the coding system¹² and this would partly contribute to the wide range of reports.

The second data source used by Roughead¹² was the Quality in Australian Health Care Study¹³ which was a retrospective study in a representative sample of hospitals in Australia. The study aimed to estimate the incidence and nature of adverse events (AE) associated with hospital admission. The study defined AEs as ADRs and medication errors, and excluded intentional overdose. It was found that 1.8% of hospital admissions were associated with severe AEs and 43% of all AEs were potentially avoidable.¹³

The third data source was an Australian study assessing drug related hospital admissions in public, acute teaching hospitals and consisted of a total of 14 Australian studies conducted from 1988-1996 and aimed to identify drug related

hospital admissions.¹⁴ Drug related hospital admissions that were included were ADRs, non-compliance and overdose.¹⁴ From those studies it was found that 1.4% - 3.6% of hospital admissions were drug related and 32% - 69% were potentially avoidable.¹⁴ It is not known why there was a wide range of potentially avoidable drug related hospital admissions but contributing factors could have included difference of study methods, hospital size and the time setting, which were between 1988 and 1996.

From the results of the three data-sources, Roughead estimated that at least 80 000 hospitalisations each year in Australia are drug related and estimated to cost \$350 million annually.¹² The true incidence of drug related hospital admissions would probably deviate from the results of this study since the author combined three different data sources which utilised different definitions of drug related hospital admission and different study methodology. However, these results still reflect a serious problem in drug related hospital admissions in Australia and ADRs form a significant part of this problem.

Dartnell *et al*¹⁵ studied 965 admissions in a Melbourne tertiary teaching hospital during 30 consecutive days to determine the incidence of drug related hospital admissions. Dartnell *et al*¹⁵ defined drug related admissions as admission due to some aspect of drug therapy and not as a result of a disease progression. Cases of intentional overdose were excluded from the evaluation. It was found that 5.7% of all admissions were drug related, with the cause including prescribing factors (26%), patient non-compliance (27%) and ADRs (47%). The reactions were categorised as definitely avoidable (5.5%), possibly avoidable (60.0%) and not avoidable (34.5%). Extrapolation of the data to give an estimated cost of drug related admissions to the hospital's annual budget was approximately \$3.5 million for 5 572 bed-days.¹⁵ The results of the study only represent a tertiary hospital which can be expected to have sicker patients.

Both Roughead¹² and Dartnell *et al*¹⁵ assessed the incidence of drug related hospital admissions. ADRs were included in the definition of drug related hospital admissions. However, the definitions of drug related hospitalisation were not consistent throughout the studies. Therefore, the overall incidence of drug related

hospitalisation might deviate from the study results. Other factors contributing to the difference of the results were different study methods, different populations studied and different methods in assessing patients.

Despite the relatively high incidence of ADRs in hospitalised patients, only a small proportion are reported, either to pharmaceutical companies or to the national reporting centre.^{1,5,16-18} However, there is no general figure available for underreporting.¹ A survey of hospital records in five district hospitals in the United Kingdom (UK) showed that the number of idiopathic thrombocytopenic purpura cases occurring following mumps, measles and rubella vaccination were five times higher than was reported to the Committee on Safety of Medicine (CSM).¹ A survey over a 5 month period in a hospital in Western Australia (WA) revealed that from 164 ADRs identified, only 13 were reported to the Adverse Drug Reaction Advisory Committee (ADRAC).¹⁹ These studies underline the problem of underreporting. Furthermore, it is suggested that reporting of serious ADRs rarely exceeds 10%^{6,8} and only 2-4% of non-serious ADRs are reported.⁹ It has been estimated in Australia that one ADR report is forwarded per 40,000 prescriptions written¹⁷ and this level of reporting is among the highest in the world.^{20,21}

1.3. Detection of ADRs

The ADR profile of a drug is identified during both pre-clinical studies and post-marketing studies. Pre-marketing studies by pharmaceutical companies aim to determine efficacy and safety of a drug.³ These studies are mostly done in small numbers of selected patients over a short period of time. As a result, generally only type A reactions are detected, and the true ADR profile is often not known until after the drug has been widely used.^{3,22,23}

Post-marketing studies aim to identify and quantify the unrecognised ADRs, determine predisposing factors to ADRs, and to obtain evidence for wider use of the drug.³ Post-marketing studies include anecdotal reporting (case reports), voluntarily organised reporting system that relies on spontaneous reporting, intensive event monitoring, cohort studies (prospective studies), case-control studies (retrospective

studies), case-cohort studies, population statistics, record linkage studies and meta-analysis.^{5,6,24}

Spontaneous reporting schemes are the most widely used systems for post-marketing surveillance and ADR documentation. Case reports of suspected ADRs from health professionals and consumers (in some countries) are reported to the regulatory authorities in each country. It is mostly voluntary; only few countries make it compulsory by law (e.g. Sweden). The advantages of the schemes are that they are simple to operate, effectively identify new ADRs and are cost-effective.^{20,25,26} Health professionals are unpaid to do the reporting and it involves all drugs (newly marketed and old drugs). The spontaneous reporting scheme is dependent solely on individuals to detect, evaluate and send a report to the collating agency. Limitations of the system include problems with motivating individuals to complete reports, long latency reactions may be missed, data is often incomplete, causality is difficult to assess and reactions are under reported.^{20,26}

1.4. ADR Reporting Scheme in Australia

Australia monitors ADRs through a spontaneous reporting scheme which is co-ordinated by the Adverse Drug Reaction Advisory Committee (ADRAC). The system invites reporting from all health professionals.^{3,20} The committee encourages reporting of all suspected reactions to drugs and other medical substances (including herbal and traditional or alternative remedies). They also encourage the reporting of seemingly insignificant or common adverse reactions that may highlight a widespread prescribing problem. However, ADRAC particularly asks for reports of,²⁷

- ◆ all suspected reactions to “new drugs”, especially “drugs of current interest” which are listed in every edition of the Australian Adverse Drug Reactions Bulletin.
- ◆ all suspected drug interactions, and

- ◆ reactions to other drugs or vaccines which are suspected of significantly affecting a patient's management, including reactions suspected of causing:
 - death
 - danger to life
 - admission to hospital
 - prolongation of hospitalisation
 - absence from productive activity
 - increased investigation or treatment costs
 - birth defects.

Standard pre-paid reporting forms, also known as the "blue card" are available through various sources such as the Adverse Drug Reactions Bulletin, the Schedule of Pharmaceutical Benefits, Australian Medicines Handbook (AMH), the Adverse Drug Reactions Unit of the Therapeutic Goods Administration (TGA) or from <http://www.health.gov.au/tga/docs/html/adr.htm>.²⁷ By 2002 it will be possible to submit a report form through the website.²⁷ Data included on the 'blue card' are patient demography (record no, sex, age, height, weight), description of the reaction, all drug therapy prior to the reaction, dosage and route of the drugs involved, pertinent dates, reason for the use of the drugs, treatment of the reaction, outcome, sequelae, comments and reporter name and address (Appendix 1).²⁸ The minimum requirements expected by ADRAC include the identification of the drug, the reaction, patient (initials, age, gender) and reporter.²⁷ The ADR forms from other countries such as the UK and the US ask for similar information. In addition, the US ADR form asks specifically for the relevant tests/laboratory data and information on suspected medical device. However, the 'blue card' and the UK form provide space for additional information and the laboratory test results could be included when necessary. Besides the reporter detail, when the reporter is not the clinician, the UK ADR form asks for the clinician's detail. A limitation of the three forms is the limited space available for the drug therapy details prior to the reaction. The ADRAC 'blue card' provides space for 6 drugs, compared to 5 drugs for the UK form and a smaller space is available in the US form.

ADR reporting is important since it is the cornerstone of drug safety after the release of a drug into the market. It has been shown over the years that ADR reporting has

provided early warning in drug safety⁹. A recent example was the early warning of Australian cases of rhabdomyolysis associated with cerivastatin (Lipobay).²⁷ The ADRAC reports were a major driving force to the investigation of the problem in Australia, and cerivastatin has been withdrawn by the sponsor.²⁷

The total number of ADR reports in Australia has increased steadily, partly because of a higher number of reports submitted by hospitals. Approximately 30% of ADR reports in 1992 came from either hospital or community pharmacists, with 75% of hospital reports being reported by hospital pharmacists.^{18,29} The quality of reports submitted by hospital pharmacists has been acknowledged by ADRAC. Hospital pharmacists can make a valuable contribution to the reporting scheme since many of the serious ADRs occur in hospitals or result in hospitalisation.^{18,29}

1.5. ADR Reporting Systems in Australian Hospitals

The Society of Hospital Pharmacists of Australia (SHPA) Standards of Practice for Clinical Pharmacy includes guidelines in ADR management. The guidelines state that clinical pharmacists should³⁰

- ◆ identify and monitor patients who are most susceptible to ADRs
- ◆ detect ADRs as part of routine drug monitoring
- ◆ encourage other health professionals and patients to report ADRs
- ◆ identify patients who have experienced previous ADRs

Collection of data and appropriate documentation should be done after ADRs are suspected. Afterwards, pharmacists should ensure that medical staff are notified of the ADR, and the ADR report be forwarded to ADRAC. Minimising the ADR can be done by monitoring the patient, informing the patient who experienced the serious ADR, prudent use of drugs with a high rate of ADR and ADR documentation.³⁰

Many Australian hospitals have well-developed ADR identification and reporting systems; however the systems used vary among Australian hospitals.³¹⁻³³ A survey of 90 hospitals in 1982 reviewed ADR identification and reporting systems.³¹ A questionnaire was sent out to Australian hospitals with 250 beds or more and obtained a 55.5% response rate. Of the 50 hospitals who responded to the

questionnaire, 8 hospitals had a formal ADR monitoring system, involving a notification card system (see section 1.5.2), the completed chart check-off system (see section 1.5.3), the chart scanning system (see section 1.5.4), and the intensive drug monitoring studies system (see section 1.5.5). Another 26 hospitals utilised the ADR 'blue card' without any formal system (the spontaneous reporting system, see section 1.5.1) and 16 hospitals had no ADR system.³¹ This study was completed 20 years ago and its relevance to current practice is unknown. Furthermore, this study was only representative of large hospitals.

There were two other studies in Australian hospitals which utilised the notification card system (see section 1.5.2) and the active seeking of ADRs system (section 1.5.6).^{32,33} These are discussed in the relevant sections below. When the reporting rate was used, it was calculated from the number of ADR reports sent by the hospital divided by the number of inpatients.

1.5.1. The Spontaneous Reporting System

The system involves doctors completing an ADR reporting form (blue card) after being notified of an ADR or observing an ADR directly.³¹ The term utilised in the literature was 'The Voluntary Reporting System'. However to avoid confusion 'The Spontaneous Reporting System' is used in this review. The term 'spontaneous reporting' represents the hospital system, which depends solely on the doctor or health professional to report ADRs spontaneously. This method of ADR reporting is inexpensive and able to cover a wide range of ADRs in the hospital, however the major limitations include under-reporting and difficulty in obtaining follow-up.

1.5.2. The Notification System

The literature utilised the term 'The Notification Card System'³¹, but for the purpose of more flexible categorisation and not being limited only to notification by card, 'The Notification System' is used here. After an ADR has been suspected, the doctor or other health professional fills in a card to notify a designated ADR reporting person

that an ADR has been suspected.³¹ The designated person (usually a pharmacist) fills out the reporting form and sends it to ADRAC. The doctor and patient are subsequently informed of the ADR.³¹ The system has the advantage of less work for the doctor in dealing with a report. Yap³¹ argued that this method is one of the most suitable methods that should be implemented in many hospitals in Australia.

Swan *et al*³² studied the ADR reporting system (which is still in operation) at Sir Charles Gairdner Hospital in Western Australia. The system could be categorised under the Notification Card System. The procedure involves a doctor completing a red alert card when notified of any ADR. The pharmacist then completes the necessary documentation and sticks a red alert label on the outside cover of the medical record and places details of the ADR on the inside cover. The ADR is then reported to the designated pharmacist who forwards a report to ADRAC and notifies the patient's General Practitioner (GP) regarding the ADR. During the twelve month study period, 108 reports were received and 90 were forwarded to ADRAC from a total of 22,000 inpatients.³² The reporting rate of 0.5% was represented by 108 reports. However, the reporting rate before the commencement of the study was unknown, thus precluding any assessment of the improvement of the ADR reporting after commencement the of the study.

The Notification System is suitable for implementation in Australian hospitals. Less work to deal with the reporting for the health professionals involved would probably improve the reporting rate. The quality of reports would likely be improved because of a designated person who completed the ADR reports. However the system still relies on voluntary notification of the suspected ADRs by health professionals.

1.5.3. The Completed Chart Check-Off System

Doctors are required to check an ADR alerting slip, that asks whether ADRs have occurred (yes or no options only) each time they complete a patient medication chart.³¹ If an alert slip is ticked, personnel who are responsible for ADR reporting will pull out the alerting slip and review it.³¹ The medication chart of the discharged

patient is not complete without the alerting slip.³¹ This method is considered to be the most suitable method beside the Notification Card System, according to Yap.³¹ It is expected that most ADRs would be found. The advantage of the method, similar to the Notification System, is the ease of reporting because of the designated person dealing with the reporting.

1.5.4. The Chart Scanning System

In this system, the charts of every patient discharged from the hospital will be scanned for an ADR as an active method of seeking ADRs.³¹ The charts include the patient's diagnosis chart, summary sheets, progress notes and consultation sheets.³¹ The author argued that this method is time consuming but provides more effective results compared to others. Yap³¹ suggested that scanning could be limited to newly marketed drugs or to a certain ward depending on the staffing level.³¹ The benefit would be the possibility of generating more reports, however it is unknown whether reports generated from this method are of a better quality and quantity compared to other methods. The disadvantages would be the number of full time staff involved, which is time consuming and costly. Another limitation is the difficulty in identifying ADRs solely from the medical record since it depends on good documentation by the health professionals involved. A study to compare the number of reports and quality of reports generated from this method compared with others would be needed.

1.5.5. The Intensive Drug Monitoring Studies

The system involves systematic surveillance done by a full time, trained health professional to a small, well-defined group of inpatients.³¹ This method unlike the others is a prospective method. The advantages are the ability to derive incidence rates, to find factors that may contribute to reactions and to identify drug interactions.³¹ The disadvantages of such a method are the expense and the small sample population.³¹ This method would be expensive, however studies of a specific drug can be done.

1.5.6. The Active Seeking of ADRs System

St Vincent's Hospital combined a spontaneous reporting system and actively seeking ADRs system.³³ The suspected ADRs were reported to the Clinical Pharmacology Department through three ways including the active seeking system:³³

- ◆ Spontaneously reported by doctors or nurses via telephone, filling in an ADRAC form or the 'easy-report' sticker. The telephone reports and the 'easy-report' stickers are then followed-up by the department. This method could be categorised as the Notification System using telephone line and 'easy-report' sticker (section 1.5.2).
- ◆ Screened through the discharge summary (the scanning system, section 1.5.4)
- ◆ Reported to the Clinical Pharmacology nurse, who visits wards weekly to ask about ADRs (actively seeking ADRs).

In a period of 16 years (1974-1990) St Vincent's Hospital forwarded a mean of 87 reports per year to ADRAC and a range between 112 and 193 reports since 1985.³³ ADR reports submitted in 1991 (n=148) resulted in a 0.56% reporting rate.

The system is a combination of the Spontaneous Reporting System, the Notification System and the Chart Scanning System (section 1.5.1, 1.5.2, and 1.5.4) with the addition of actively seeking ADRs in the ward by the Clinical Pharmacology nurse. The benefits are combined and could eliminate some of the limitations. Under reporting that is associated with spontaneous reporting could be eliminated by the active screening and seeking of ADRs. However, cost and staffing levels remain the limitations of this system and it is probably difficult for small to medium sized hospitals with limited resources to implement this system.

The authors³³ also surveyed fifteen teaching hospitals in Melbourne in 1992, to compare the ADR reporting system and reporting rate between St Vincent's Hospital and fourteen other Melbourne hospitals. The authors highlighted the possibility of under representation of the reporting rate from each hospital as some reports might be forwarded through ADRAC without any copy submitted to the hospital.

There were three hospitals that had a moderate reporting rate between 0.34% to 0.72% per year including St Vincent's Hospital (0.54%), while the other twelve hospitals had a low reporting rate between 0.02% to 0.11% per year. The reporting figure also was presented in the number of reports per 100 inpatients and resulted in a range between 1 and 33 reports per 100 inpatients. The authors stated that there were no consistent differences between the three systems implemented by the hospitals.

The active seeking of ADRs system can include:

- ◆ seeking of ADRs by clinical pharmacists or clinical pharmacology nurses
- ◆ screening new admissions
- ◆ attending ward rounds and nursing handovers
- ◆ screening intensive care and coronary care patients
- ◆ querying treatment changes
- ◆ querying treatments used in ADRs
- ◆ screening case notes and biochemistry results
- ◆ medical records involvement in notification ADRs
- ◆ regular ADR reminder

1.6. ADR Reporting System Other than Australian Hospital

The reporting systems outside Australian hospitals were found to be similar to those used in Australia. Some of the hospitals had given rewards and individual acknowledgement for reporting ADRs. There was also regular promotion and education or training regarding ADRs provided.³⁴⁻³⁶ The Notification System was used by some hospitals, which also utilised the telephone hotline as the notification method of the suspected ADRs.³⁴⁻³⁶

The Rhode Island Department of Health planned, implemented and evaluated a program to increase reporting of suspected ADRs to the US Food and Drug Administration (FDA) by doctors.³⁴ The notification system using telephone was

used in accordance with other efforts to increase ADR reporting. The project was done in three years and the interventions given were:

- The local doctors were asked to send the ADR reports to an ADR Committee, which were then forwarded to the FDA by the committee
- A simple and convenient-to-complete ADR form was created
- Telephone information and reporting line was established
- The promotion and education of the new ADR reporting system was carried on through direct mailing, presentations to doctors, advertisements and regular articles in the local periodicals
- Individual acknowledgements to the reporter were given

A year before the project, there were 11 reports submitted to the FDA from Rhode Island which had more than 2000 doctors.³⁴ Two years after the commencement of the project there was a 17-fold increase in ADR reports sent to the FDA (201 reports) which represented 3.5% of the total reports submitted to FDA. By comparison, the Rhode Island population represented 0.4% of the total US population. Beside the number of reports, the type of ADRs reported was also monitored.³⁴ Serious reports, which were defined by FDA as reactions that result in death, prolonged or new hospitalisation, and permanent or severe disability, represented 0.4% of the total serious reports reported to FDA before the project began. After the commencement of the project, it represented 3.6% of the total serious reports. There were also changes in knowledge and attitudes toward the ADR reporting system found by a pre- and post-intervention survey of the doctors in Rhode Island.³⁴ The investigators concluded that doctors' reporting of ADRs can be improved by promotional interventions and by a convenient reporting system. However the project did not further investigate which of the interventions were particularly effective in changing doctors' knowledge, attitude and behaviour.

North Broward Hospital District in Finland established an ADR task force consisting of clinical coordinators from four county hospitals in 1996.³⁵ They also implemented the Notification System with an addition of other efforts to achieve higher reports. The objectives were:³⁵

- To adopt ADR definition acceptable to all pharmacists in the district

- To design an ADR form
- To create written ADR policy
- To implement the new changes at each facility

The ADR policy was then implemented in the largest district hospital in the area and it included:³⁵

- ADR in-service training,
- Certificate of recognition for reporting ADR
- A free dessert reward for reporting ADR (initiated in April 1997)
- Distribution of the ADR forms to each unit in the hospital
- 24 hours telephone line where the reports could be submitted or report could be submitted to the pharmacy department
- Reminders of the ADR reporting in a form of posters and flyers were posted in all patient care areas including poster promotion of the 'free dessert reward'.

There was a 53% increase of reports, from 168 reports in 1996 to 257 reports in 1997. The reporting rate was 0.6% in 1996 before the commencement of the new ADR policy, and increased to 0.9%.³⁵ The reporting rate obtained is higher than what was obtained in the Australian hospitals discussed in section 1.5. The addition of ADR in-service training, recognition of reporting ADR, reward for reporting ADR, and reminder or promotion of the ADR reporting, probably contributed to the higher reporting rate obtained by the district hospital in North Broward.

A hospital in the US implemented the Notification System using a telephone hotline combined with the Chart Scanning System as a part of the improvement of ADR reporting within the hospital.³⁶ A multidisciplinary ADR committee to improve ADR reporting was established. The committee members consisted of representatives from the Department of Pharmacy, the Quality Assessment and Utilization Management (QA), and other hospital departments or divisions, for example the Department of Medicine, Surgery and Nursing.³⁶ The committee commenced:

- An ADR hotline, which could receive reports of suspected ADRs for 24 hours a day through an answering machine and the number was posted in various places

- A carefully developed ADR form, copies of which were located in all nursing stations and in the pharmacy department and upon completion, could be forwarded to the pharmacy department
- Addition of ADRs into regular review of medical records by the QA members, which allowed them to identify ADRs as part of their QA duty

The suspected ADRs were then investigated by a pharmacist, presented before the ADR Reporting Committee, and reported monthly to each department and division. The committee also implemented an education program to increase awareness in ADRs and to help pharmacists identify and report suspected ADRs.³⁶ After a year of operation of the method, ADR reports were 1.2 per 100 hospital admissions and it increased to 2.1 per 100 admissions in the following years.³⁶ However, compared to the Melbourne hospitals, with a range between 1 and 33 reports per 100 inpatients, reports obtained by this hospital could be considered low. There were 53% of reports originating from ADR report forms, 35% were reported through the hotline, 5% were reported directly to the ADR committee and 6% were reported by other mechanisms.³⁶ The results showed that the implementation of the Chart Scanning System only contributed a small proportion in adding to the number of ADR reports.

1.7. Survey of the Hospital Pharmacy Departments Involvement in ADRs Reporting

In the UK, the 'yellow card' scheme is the National post-marketing surveillance of ADRs operated by the Medicines Control Agency (MCA) and the Committee on Safety of Medicines (CSM).³⁷⁻³⁹ The scheme was started in 1964 and was restricted only to doctors, dentists and coroners. Nurses and pharmacists were not allowed to participate in the scheme. In an attempt to increase the number of ADR reports, in April 1997 hospital pharmacists were invited to join the scheme after a successful pilot scheme.^{37,38} All suspected ADRs to the new drugs are to be reported using the prepaid yellow card. A black triangle symbol was used to identify the recently marketed drugs. Only serious and unusual ADRs should be reported for the older drugs. Suspected ADRs to other therapeutic agent should also be reported.³⁷⁻³⁹

There are two recent studies assessing the ADR reporting system in pharmacy departments in the UK.^{37,38}

Ferguson and Dhillon³⁷ surveyed Drug Information Centres attached to hospital pharmacies listed in the Drug Information Pharmacist's Group (DIPG) a year after the 'yellow card' scheme for hospital pharmacists was launched. The aim was to identify how the hospital pharmacy managed the ADR reporting, the existence of education for pharmacy personnel, the existence of designated pharmacists for ADR reporting and the number of ADR reports sent to CSM. A response rate of 74% (n=185/250) was obtained by sending a follow up questionnaire.³⁷ The results included:

- In-house procedures in ADR reporting were available in 35% of the pharmacy departments
- Education for hospital pharmacists was provided by 54% of respondents in a form of training within pharmacy departments and 20% in a form of training given by external organisations
- A designated person for the collection of data existed in 32% of pharmacy departments
- The majority (83%) of respondents submitted five or fewer reports to CSM in the previous year

Factors associated with higher reporting rates by pharmacy departments included the existence of the ADR procedure, promotion, education and a designated ADR person.³⁷ The reporting rate used in the analysis was actually the number of reports submitted by the pharmacy department to the CSM. The authors did not take into account the number of pharmacists from each pharmacy department or the size of the hospital when assessing the association between number of reports and contributing factors, making it difficult to judge the magnitude of the reports. Therefore factors found to be associated with the reporting rate could be problematic. Another limitation was the number of ADR reports submitted to CSM, which was based on the recollection of the hospital pharmacy respondents. Therefore hospital pharmacies with a designated ADR pharmacist might have better records on the number of reports submitted to CSM. Reviewing the number of

reports received by CSM could have been used to confirm the departments' reporting rate.

Green *et al*³⁸ surveyed 100 hospital pharmacy departments selected from the DIPG and a further 100 selected from the Chemist & Druggist Directory (C&DD). The aim was to assess the impact of the involvement of pharmacists in the 'yellow card' scheme. The response rate obtained was 76.5% (153/200), achieved by sending a follow up questionnaire.³⁸ Results included

- A formal hospital ADR reporting scheme existed in 18.9% of pharmacy departments
- Education was provided to the pharmacist by 62.3% of hospital pharmacies, and it was found that departments with a greater number of pharmacists were more likely to provide education or training in ADRs
- A designated ADR specialist pharmacist existed in 9.3% of pharmacy departments
- The median number of ADR reports sent to the CSM was 6 (range 3 – 100) reports and the reporting rate ranged from 0-0.14

Factors found to have increased the number of reports were number of methods available, number of professionals available to report ADRs and promotion of ADRs. However these were not statistically significant. The selection criteria of pharmacies surveyed were not explained; consequently it is difficult to assess if the results of the study are representative of UK hospital pharmacy. Furthermore, the reporting rates obtained from the respondents were low compared to the previous study in Australia which found reporting rates ranging from 0.02 – 0.72.³³

1.8. Knowledge and Attitudes of Hospital Pharmacists and Doctors Toward ADR Reporting

Reporting ADRs to new drugs, however trivial, is important as they may not have been recognised before. Furthermore, any serious reactions or reactions not well known (or associated) to an established drug also need to be reported. Known

ADRs are also important to report in order to accumulate information on these reactions to assess their clinical significance.⁴⁰ Factors that might encourage or discourage health care professionals from reporting ADRs were examined in several studies (Table 1.1 and Table 1.2).^{8,16,41-44} There is a lack of any Australian studies assessing the attitudes and understanding of health care professionals towards ADR reporting.

Table 1.1 Summary of factors which encourages doctors or pharmacists to report ADRs to the appropriate body. Results were obtained from various published studies and are presented as a percentage of agreement from the respondents.

Factor	Study (% agreement)					Overall range
	1 ⁸	2 ⁴¹	3 ⁴²	4 ^{44 a}	5 ¹⁶	
1. Serious reaction	99	88	74	83 – 99	95	74 – 99
2. Unusual reaction	99	78	-	63 – 89	89	63 – 99
3. Reaction to a new product	99	84	-	64 – 91	91	64 – 99
4. Certainty of the ADR	82	89	41	29 – 76	49	29 – 89
5. Well known reaction associated to a drug	13	19	-	-	-	13 – 19
6. Active support	-	86	-	-	-	86
7. Written hospital policy	-	74	-	-	-	74

^a Study 4 presented the results from surveys in 9 countries in Europe, therefore data are presented in the table as a range of responses

A recent study by Green *et al*⁸ (Study 1), surveyed the attitudes and understanding of UK hospital pharmacists towards ADR reporting in March 1999. 600 questionnaires were sent out to randomly selected hospital pharmacists from 7000 members of the Royal Pharmaceutical Society of Great Britain (RPSGB). A response rate of 53.7% (n=322/600) was obtained. They also developed six hypothetical ADRs and asked respondents to identify which one(s) they would report. A mean of 3.7±1.7 reports would have been reported by hospital pharmacists out of five hypothetical ADRs which the CSM indicated should have been reported. Using a stepwise logistic regression of the six hypothetical ADRs, they found that hospital pharmacists were significantly more likely to report serious reactions to new drugs and reactions not well known to be associated with a

particular drug.⁸ There was no explanation on the selection criteria of the hypothetical ADR categories. A potential shortcoming of the study was that only 6 hypothetical questions were used.

Sweiss and Wong⁴¹ (Study 2) surveyed hospital pharmacists in the UK to ascertain factors that could affect reporting ADRs. A questionnaire was sent to randomly selected groups of hospital pharmacists from the RPSGB in July 1998. A response rate of 63% (n=346/548) was obtained. Respondents were more likely to report serious ADRs (87.8%) than trivial ADRs, rarely occurring ADRs (78.1%) than common ones, and newly marketed drugs (84.2%) versus an established drug. They also found two factors that may encourage respondents in reporting ADRs, these being active support from the medical and pharmacy staff (86.3% agreement), and the existence of written ADR policy (73.7% agreement).⁴¹ However, there is no reported evidence that written ADR policies improve the ADR reporting rate.

Both studies utilised the same database to select the population. The respondents from the Sweiss and Wong study comprised approximately 7% of the all UK hospital pharmacists while respondents from Green *et al*⁸ study was approximately 5% of all hospital pharmacists. Agreement in the factors that may discourage and encourage from reporting ADRs were found by both studies as presented in Table 1.1 and Table 1.2.

In 2000, Bäckström *et al*⁴² (Study 3) reported factors that hinder ADR reporting. It was a survey of all doctors (n=1274) in two areas in Northern Sweden and the response rate was 58.7%. A reminder letter had been used to improve response rate. The aim was to investigate the attitudes of GP and hospital doctors in Sweden towards ADR reporting. A limitation of this study includes the limited areas of the sample population. Results are summarised in Table 1.1 and Table 1.2.

Table 1.2 Summary of factors which would deter doctors or pharmacists from reporting ADRs to the appropriate body. Results were obtained from various published studies, and are presented as a percentage of agreement from respondents.

Factor	Study (% agreement)						Overall range
	1 ⁸	2 ⁴¹	3 ⁴²	4 ^{44 a}	5 ¹⁶	6 ^{43 b}	
1. Concern that the doctor gets a copy of the ADR form	9	-	-	-	-	-	9
2. Lack of confidence (pharmacists) to discussing with the doctor	16	-	-	-	-	-	16
3. Concern about sending in an inappropriate report	34	-	-	-	-	-	34
4. Lack of time to fill in a report	45	-	-	-	-	-	45
5. Concern that a report will generate extra work	18	-	-	-	-	-	18
6. Lack of time to actively look for ADRs	57	-	-	-	-	-	57
7. If busy, will less likely to report	-	51	-	-	-	-	51
8. Lack of time	-	-	21	22 – 78	21	31 – 42	21 – 78
9. The absence of a fee	5	-	-	-	-	-	5
10. Level of clinical knowledge is not adequate	32	-	-	-	-	-	32
11. Don't feel the need to report ADR	41	-	-	-	-	16 – 26	16 – 41
12. Report form is not available when needed	10	-	-	8 – 64	21	-	8 – 64
13. Difficulty in finding the right form	-	-	9	-	-	-	9
14. Concern about legal liability	-	4	-	0 – 11	1	2 – 3	0 – 11
15. Patient confidentiality	-	25	-	0 – 5	3	-	0 – 25
16. Forgetfulness	-	-	46	-	-	-	46
17. Hesitance to report on suspicion	-	-	24	-	-	-	24
18. Giving priority to other matters	-	-	13	-	-	-	13
19. Uncertain about how to report	-	-	9	3 – 38	3	20 – 37	3 – 38
20. Too bureaucratic	-	-	-	-	-	31 – 40	31 – 40
21. Unaware of the national ADR reporting	-	-	-	-	-	7 – 16	7 – 16
22. Telephone number unavailable	-	-	-	3 – 50	-	-	3 – 50
23. Address of reporting agency unavailable	-	-	-	3 – 64	-	-	3 – 64
24. Worried of appearing foolish	-	-	-	1 – 11	8	-	1 – 11
25. Reluctant to admit that the treatment may cause a patient harm	-	-	-	0.2 – 8	5	-	0.2 – 8
26. Publish a personal case in the biomedical journal	-	-	-	0 – 4	1	-	0 – 4
27. Believes that all marketed drug are safe	-	-	-	1 – 11	5	-	1 – 11

^a Study 4 presented the results from surveys in 9 countries in Europe, therefore data are presented in the table as a range of responses

^b Study 6 presented the result under three different categories namely general practitioner, surgical specialist and medical specialist

Belton and The European Pharmacovigilance Research Group⁴⁴ (Study 4) conducted a survey in November 1993 – March 1994 in 9 countries of the European Union to determine attitudes of doctors in ADR reporting. Response rates obtained ranged from 19.7% (Spain) to 77.0% (Sweden) with a median response of 52.4%.⁴⁴ Results are presented in Table 1.1 and Table 1.2. A potential limitation of this study was the low response rate from three countries (Italy, Portugal and Spain), which were lower than 30%.

Belton *et al*¹⁶ (Study 5) surveyed 500 doctors that were randomly selected from the 1992 UK Medical Directory. The aim was to assess doctors' understanding of the national reporting scheme and reasons for not reporting the ADRs to the CSM.¹⁶ An interesting limitation was the representativeness of this study because the median year of graduation of respondents was 1975 while non-respondents was 1979.

Eland *et al*⁴³ (Study 6) assessed attitudes of doctors in the Netherlands towards ADR reporting in 1997 to find out the types of ADRs reported. Response rate of 72.7% (n=1442/1984) was obtained from a randomly selected group (10%) of GPs, surgical specialists and medical specialists in the Netherlands.⁴³ The questionnaire included 16 hypothetical ADRs and the doctors were asked to indicate which they would report to the national reporting centre. The hypothetical ADRs were selected based on the combination of serious versus non-serious ADRs, ADRs to new versus established drugs, and well-known versus newly discovered ADRs. From the hypothetical ADRs it was found that serious and new ADRs were underreported by the respondents.⁴³ Reasons that encourage and discourage reporting ADRs were consistent with those of the previous studies as presented in Table 1.1 and Table 1.2.

As can be seen from Table 1.1, serious ADRs, unusual reactions, reactions associated with a new drug, and the confidence in the diagnosis of the ADR were factors that would encourage doctors and hospital pharmacists in reporting ADRs. Factors that would discourage doctors and hospital pharmacists from reporting ADRs varied as can be seen in Table 1.2. However, lack of time, the availability of the report forms, and uncertainty of how to report, were most often included in the response. Interestingly, in almost all of the discouraging factors, respondents

showed low agreement. Further research is needed to find factors that would deter health professionals from reporting ADRs. Similar studies in Australia are needed to assess the attitudes and knowledge of health professional towards ADRs reporting as well as the current reporting system implemented in Australian hospitals.

1.9. Penicillin Allergy

Penicillins and other β -lactams are amongst the most important antibiotics in clinical use. However, the use of penicillin has been limited by the high incidence of allergic reactions.^{45,46} Allergic reactions to penicillins range between 1-10%, with the incidence of anaphylactic (life-threatening) reaction ranging between 0.004-1.0015%.⁴⁷⁻⁴⁹

A history of penicillin allergy alone is not adequate to predict immediate allergic reactions following subsequent administration of penicillin.^{46,50} Only 10-20% of patients with self reported penicillin allergy are truly allergic to penicillin when assessed with skin tests.⁴⁶ Factors attributed to misdiagnosis of penicillin allergy include faulty recall by patients, decline of the hypersensitivity naturally, false recognition of the allergic cause and problems with contaminated preparations of older penicillins.⁵¹ It has been reported that 10-20% of patients admitted to hospital have a history of allergic reaction to penicillin.^{47,50,52} These patients will likely receive alternative antibiotic regimens which may lead to less than optimum therapy.

Skin rash is the most frequent ADR associated with penicillins (10% of patients) while anaphylaxis is the most serious ADR, occurring in approximately 1 in 5000 patients and causing death in approximately 10% of these patients.⁴⁰ Penicillin hypersensitivity can be classified into three categories^{46,53,54}:

- ◆ Immediate reactions (Type I reaction, IgE mediator). These reactions are manifested as anaphylactic reactions often associated with systemic symptoms including diffuse erythema, pruritus, urticaria, angioedema, hyperperistalsis, hypotension, or cardiac arrhythmias. The reactions are more likely to take place with parenteral administration than oral administration. Most reactions occur within one hour of administration of penicillin. However, some reactions may

happen between 1 and 72 hours after administration and are known as 'accelerated manifestation'.^{46,53,54}

- ◆ Late reactions (Type II-IV, non-IgE mediator). These reactions occur after 72 hours of penicillin exposure. Clinical signs include increased clearance of red blood cells and platelets by lymphoreticular system (Type II reaction, IgG mediator); serum sickness and tissue injury (Type III reaction, IgG or IgM immune complexes mediators); and contact dermatitis (Type IV reaction).^{46,53,54}
- ◆ Other reaction (idiopathic). Reactions occur usually after 72 hours of penicillin administration. Clinical signs are maculopapular or morbilliform rashes and these occur in 1–4% of all patients receiving penicillin.^{46,54}

Treatment for anaphylactic reactions due to penicillin allergy is similar to other anaphylactic reactions. Some main lines of treatment include^{55,56}:

- ◆ Adrenaline, the primary drug therapy for the treatment of anaphylaxis. The dose for mild reactions is 0.3-0.5 mg SC, and the dose for severe reactions is in the order of 5-10 µg/min by IV infusion.^{55,56}
- ◆ Inhaled β_2 -agonists (e.g. salbutamol 2.5-5 mg every 1-2 hour as needed)^{55,56}
- ◆ Antihistamines (diphenhydramine 25-50 mg IV over 1 min)^{55,56}
- ◆ Corticosteroids (equivalent of hydrocortisone 200-3000 mg IV)^{55,56}
- ◆ Vasopressors (noradrenaline, methoxamine)

In the prevention of allergic reaction to penicillin, proper classification and documentation of allergies due to penicillin before choosing antimicrobial therapy is essential since it could be either dangerous or inappropriate. Before treatment with penicillin is initiated, a detailed history of previous allergic reactions associated with penicillin and the presence of other allergic disorders such as asthma and hay fever has to be investigated. The incidence of penicillin allergy in atopic patients is higher than in non-atopic patients.⁵³ Past history of immediate reactions (Type I reaction) to penicillin and other β -lactam antibiotics (except for aztreonam) is a contraindication for further penicillin administration.^{28,46,48} Late manifestation is a relative contraindication.^{28,46,48} Other diseases that may increase the incidence of penicillin allergy should be considered (e.g. glandular fever associated with the increased incidence of ampicillin allergy).⁵³

In circumstances where penicillin use is very important, skin tests, desensitisation or a test dose of penicillin in controlled conditions is important to minimise the risk of immediate allergic reactions.⁴⁸ However, Salkind *et al*⁴⁶ indicated that skin tests are best used in patients with a history of type I reactions as patients with no history of type I reactions were less likely to react to it.

1.10. Cross-Sensitivity between Penicillin and Other β -Lactam Antibiotics

There are four different groups of antibiotics which have a β -lactam ring (BLR) in their chemical structure. These are the penicillins, cephalosporins, carbapenems and monobactams.⁵⁷

The incidence of allergic reactions to cephalosporins in patients hypersensitive to penicillin is approximately 8.2% whilst the incidence of allergic reactions to cephalosporins in patients not hypersensitive to penicillin is around 1.7%.⁴⁰ According to the Antibiotic Guidelines, between 3% to 6% of patients hypersensitive to penicillin experience cross reactivity to cephalosporin.⁴⁸ The use of a cephalosporin is contraindicated in patients with a history of immediate (Type I) reactions, while a history of later reaction (non IgE) is not contraindicated but cephalosporins should be given with caution.⁴⁸

Imipenem is the prototype of the carbapenem class. It is suggested that imipenem should not be administered to patients with a history of immediate reaction (Type I) to penicillin or patients with a positive penicillin skin test.⁴⁶ McConnell *et al*⁵⁸ conducted a retrospective study of patients experiencing imipenem/cilastatin and penicillin allergy. The aim was to assess cross-sensitivity in patients with documented history of penicillin allergy and the results showed that there was 9.5% (6/63) incidence of cross-reactivity.⁵⁸ The limitation of the study was the retrospective nature of the study in which there were no skin tests performed to determine the incidence of both penicillin and imipenem/cilastatin reactions. The incidence of allergy depends solely on interpretation of the documented data in

patient's medical records. In comparison, Saxon *et al*⁵⁹ found there was a 47% (9/19) cross-sensitivity between imipenem/cilastatin and penicillin in patients with a positive skin test to penicillin. In both positive and negative skin tests to penicillin, the incidence of cross-reactivity was 25% (10/40). The hypersensitivity of both imipenem/cilastatin and penicillin were determined entirely by skin test and no systemic therapy was given and this was a limitation of the study. A prospective study assessing cross-sensitivity between penicillin and imipenem would be beneficial.

Lastly, aztreonam is the respective prototype of monobactams and it has been indicated that aztreonam could be administered safely to most patients with a history of immediate reactions (Type I) to penicillin.^{46,48} There is a lack of data on cross-sensitivity between penicillins and monobactams and no studies have been identified from a recent search of Medline.

1.11. Objectives

The objectives of this study were:

1. To review adverse drug reaction reporting systems in Australian hospitals.
2. To evaluate Western Australian doctors' involvement in, understanding of and reason(s) for reporting adverse drug reactions.
3. To evaluate Australian hospital pharmacists' involvement in, understanding of and reason(s) for reporting adverse drug reactions.
4. A retrospective review and audit at Fremantle Hospital and Health Services (FHHS) to assess the incidence of cross-sensitivity between penicillin and other β -lactam antibiotics among patients experiencing penicillin allergy in FHHS and to assess the appropriate documentation of penicillin allergy in medical records at FHHS.

CHAPTER 2 RESEARCH METHODOLOGY

The study comprised four parts. Part one to part three of the study were surveys of adverse drug reaction reporting in Australia. Part four of the study was a retrospective study of penicillin allergy at Fremantle Hospital and Health Service (FHHS).

2.1. Adverse Drug Reaction Reporting Survey

Evaluation of adverse drug reaction reporting in Australia comprised three surveys. Part one of the study was a questionnaire sent to chief pharmacists of Australian hospitals. Part two of the study was a questionnaire sent to doctors in selected hospitals in Western Australia, and part three was a survey of hospital pharmacists in Australia.

2.1.1. Ethics Approval and Confidentiality

Ethics approval was obtained from the Human Research Ethics Committee (HREC) at Curtin University of Technology (Appendix 2). Written approval from FHHS HREC (Appendix 2), and approval from Sir Charles Gairdner Hospital (SCGH), Albany Regional Hospital, Geraldton Regional Hospital and Port Hedland Regional Hospital was obtained giving permission to survey hospital doctors.

2.1.1.1. Endorsement by ADRAC

Endorsement of the surveys by the ADRAC secretariat was obtained (Appendix 3) and quoted in the invitation letter to all recipients. This endorsement was important

to demonstrate legitimacy of the survey and to encourage a high response rate. In addition to endorsing the survey, members of the ADRAC secretariat selected optimal responses to the hypothetical ADR questions in the questionnaire.

2.1.1.2. Confidentiality and Informed Consent

The questionnaire sent to Chief Pharmacists was not anonymous and was coded for each hospital. Respondents were made aware of this in the invitation letter, but assured of confidentiality. To ensure respondents' anonymity in the database, codes and hospital details were kept separately during data entry and data analysis.

ADR reports in 2000 from each hospital to ADRAC were sought for the study, after gaining approval from chief pharmacists (or responsible person).

The questionnaires sent to doctors and hospital pharmacists were anonymous. There were no identifiers placed either on the instrument or on the reply paid envelope supplied. Respondents had been informed through the invitation letter that return of the questionnaire indicated their consent to participate in the study.

2.1.2. Study Design

The data collection method chosen for the study was a self-administered questionnaire (survey), which was distributed by mail. The major advantage of such a method is that large amounts of data from a wide geographical area can be gathered in a relatively short time. The major disadvantages are the potential for misinterpretation of the questions or the answer choices and poor response rate.^{60,61}

2.1.3. Questionnaire Development

Questionnaire development was based on previous ADR questionnaires.^{8,16,37,38,41,43,44,62} However, the final questionnaires for the present

study were unique in many regards, to suit the purpose of the study and the Australian setting.

Design of the questionnaires included consideration of question format (open-ended or closed-ended questions), colour of the paper and general presentation and layout. Coding for data entry also was considered as part of the questionnaire development.

The final questionnaire for the chief pharmacists comprised 39 questions over six A4 pages. Doctor and hospital pharmacist questionnaires comprised 21 questions over four A4 pages in grey and yellow colour respectively. Colours were chosen to distinguish the questionnaire among other correspondence and to attract attention.

2.1.3.1. Part One

The questionnaire for Chief Pharmacists (Appendix 4) included:

- ◆ General information related to the hospital
- ◆ Questions on the ADR reporting system in the hospital, including
 - Hospital and Departmental ADR policies
 - Details of ADR systems in the hospital and pharmacy department
- ◆ Questions on the opinions of the ADR reporting system, including
 - Should feedback be given
 - Communication method
 - Reward/fee
- ◆ ADR reports
 - number of reports sent by the hospital to ADRAC
 - number of reports sent by the pharmacy department to ADRAC

2.1.3.2. Part Two and Part Three

Questions for doctors (Appendix 4) and hospital pharmacists (Appendix 4) included:

- ◆ General information such as years of experience and current area of practice
- ◆ ADR reporting, including:
 - knowledge of how to report ADRs to ADRAC and within hospital

- opinions on the hospital's ADR reporting system
- factors that may encourage or discourage ADR reporting.
- ◆ Reports of ADRs to ADRAC in 2000.
- ◆ 15 ADR hypothetical questions. The respondents were asked to identify which ADRs they would report. The ADRAC Secretariat had provided their preference toward which ADR reports they would like to receive. The hypothetical questions were actual ADRs to the drug^{28,63} and had been selected to represent:
 - ADRs associated with newly marketed drugs and older marketed drugs
 - serious and minor ADR reactions
 - ADRs which are commonly or rarely associated with the drug

2.1.4. Sampling and Data Collection

2.1.4.1. Inclusion and Exclusion Criteria

There were no exclusion criteria for the chief pharmacist survey and all returned questionnaires were included in the analysis. Doctors and hospital pharmacists were excluded from the analysis when they were no longer working in the hospital. However they were invited to fill in the hypothetical question and their responses were included in the analysis for the hypothetical ADR questions.

2.1.4.2. Part One

This questionnaire was sent to Chief Pharmacists of all 299 Australian hospitals listed in the SHPA directory and was conducted in May-June 2001. The questionnaire was sent by mail and included a reply paid, self-addressed envelope. An invitation letter explaining the purpose of the study accompanied the questionnaire (Appendix 5). A period of 4 weeks was allocated to complete and return the questionnaire. Chief pharmacists were also asked to sign approval for the release of the number of ADR reports sent to ADRAC in 2000 by their hospital. Follow up reminders by mail and e-mail were arranged four weeks after the questionnaire was sent, with a request to reply within one month.

2.1.4.3. Part Two

The questionnaire was sent to 803 doctors from two tertiary hospitals and three regional hospitals in Western Australia. All participating hospitals had provided a list of doctors to the investigators. The hospitals were representative of secondary and tertiary hospitals from urban and rural areas in Western Australia. They were:

- ◆ Fremantle Hospital and Health Services (FHHS), a tertiary hospital at which the investigator was based for this study
- ◆ Sir Charles Gairdner Hospital (SCGH), a tertiary hospital which has a formalised ADR reporting system³²
- ◆ Albany Regional Hospital (ARH), Geraldton Regional Hospital (GRH), and Port Hedland Regional Hospital (PHRH) all of which are secondary hospitals in rural WA that are serviced by resident medical staff and/or general practitioners, and have 1-2 pharmacists on staff.

This survey was conducted in June-July 2001. An invitation letter (Appendix 5) explaining the study purpose and asking for a response within one month was posted. A reply paid, self-addressed envelope was provided. As this was a completely anonymous survey, there was no follow up reminder.

2.1.4.4. Part Three

The hospital pharmacists questionnaire was sent to 1323 hospital pharmacists obtained from the membership list of the SHPA and non-SHPA members in Western Australia. The lists of non-SHPA members from Western Australia were obtained from the chief pharmacists who were prepared to provide lists of pharmacists working in their hospital. Assurance was given that the hospital pharmacists' names and addresses would be used only for the purpose of this ADR study. This survey was conducted in July-August 2001 and all features were the same as the doctors survey (section 2.1.4.3).

2.1.5. Pilot Study

Prior to the questionnaire being administered, a pilot questionnaire was given to a number of colleague pharmacists for their comments. After revision, the questionnaires were pre-tested in a pilot group of academic staff and postgraduate students at Curtin University of Technology and hospital pharmacists at FHHS.

2.1.6. Data Entry and Statistical Analysis

The Statistical Package for the Social Sciences (SPSS) for MS Windows version 10.0[®] was utilised for data entry and data analysis.

Three main databases were created for each survey. Completed questionnaires were coded as necessary and entered through SPSS. However, most of the coding frame was created during the questionnaire development except for open-ended questions. The data entry to SPSS was double-checked for randomly selected questionnaires.

Descriptive measures such as frequencies, cross-tabulations, medians and means were applied where appropriate. The Student's t-test was performed when comparing means of two continuous variables.⁶⁴ Relationships between categorical data were examined with Chi-square (χ^2) tests. P values ≤ 0.05 were taken to be significant. Where the expected frequency of a cell was less than 2 or if more than 20% of the expected frequency was less than 5, some of the categories were collapsed into one category (where possible).⁶⁴ General linear model (GLM)/Univariate Anova were used to find association between one dependent variable and more than one independent variables.⁶⁵ The answer to questions left blank was treated as missing values.

2.2. Audit Report in Penicillin Allergy

A review of pre-identified patient medical records was conducted, to establish exposure to and tolerance of penicillins and other β -lactam antibiotics.

2.2.1. Study Design

The study design was a retrospective audit and review of medical records in FHHS. Medical records of patients experiencing an allergic reaction to penicillin during admission or causing admission in FFHS were reviewed.

2.2.2. Sample Size

A list of patients with reported adverse effect with penicillin as in-patients was obtained from the Coding Manager, Medical Record Department, FHHS. Medical records (n=138) were retrieved from the computer database for the period 1994-January 2001. The coding system for adverse effects with penicillin in FHHS was established in 1994. Only medical records of patients allergic to penicillin were included.

2.2.3. Ethics

Ethics approval for this project was obtained from the HREC from Curtin University of Technology (Appendix 2). Approval was also obtained from the HREC from Fremantle Hospital and Health Services for the retrospective audit of penicillin allergy (Appendix 2).

2.2.4. Confidentiality

As this was a retrospective audit, informed patient consent was not required. However, standard practices for ensuring patient confidentiality were adopted.

To protect the identities of the patients, a unique coding system was developed. A code number consisting of one letter and three digits was utilised on the data collection form. The patient name and medical record number were identified by that code in a separate log, held in secure storage.

2.2.5. Data Collection

Data were collected on a data collection form developed specifically for the study (Appendix 6), with a focus on demographic data and information about the incidence of penicillin allergy and exposure to other β -lactam antibiotics.

Data collected regarding the penicillin allergy included:

- ◆ Drug which caused the penicillin allergy.
- ◆ Type of allergy.
- ◆ History of previous penicillin allergy.
- ◆ History of any skin test for penicillin allergy.
- ◆ Drug alert sticker in all sections of the medical record.
- ◆ Past medical history related to the allergy.
- ◆ Relevant medication history.
- ◆ Any allergy to other β -lactam antibiotics
- ◆ Other β -lactam antibiotics given to the patients

2.2.6. Inclusion and Exclusion Criteria

Allergies to penicillin were classified as a documented penicillin allergy anywhere in the patient's medical record. Documented penicillin allergy was defined as penicillin

allergy documented or witnessed by a health care professional during admission or causing admission in FHHS.

Allergies to other β -lactam antibiotics were identified by documentation of allergic reactions to cephalosporins, carbapenems and monobactams in patient's medical records documented or witnessed by health care professionals during admission in FHHS. Only medical records from patients experiencing penicillin allergy during admission or causing admission were assessed for allergy to other β -lactam antibiotics.

Medical records with a lack of penicillin allergy documentation were excluded from the analysis.

2.2.7. Statistical Analysis

Data was analysed using the Statistical Package for Social Science (SPSS) for MS Windows version 10.0[®].

CHAPTER 3 RESULTS AND DISCUSSION

3.1. Survey of the Adverse Drug Reaction Reporting Systems in Australian Hospitals

The results from the survey of chief pharmacists in Australian hospitals are presented in this section.

3.1.1. Response Rate

The response rate from questionnaires sent to chief pharmacists was 49.5% (148/299). Of the returned questionnaires, 19 were excluded from further analysis due to the following reasons: hospitals merged or conglomerate entities (n=8); hospitals closed (n=2); non-respondents (n=9). Hence, there were 289 valid hospitals for the survey and questionnaires from 129 hospitals were included in the analysis.

The response rate of 49.5% was considered acceptable, as most surveys could expect a range of response rates between 30% and 60%.⁶¹ Response rates between 60% and 80% are considered excellent.⁶¹ Previous surveys of chief pharmacists from Australian hospitals have achieved response rates ranging between 43% and 68%.⁶⁶⁻⁶⁸ The best response rate of 68% was obtained by sending reminders by post, phone and e-mail as well as an incentive in the form of a draw for a conference registration.⁶⁶ Recent studies have shown that response rates of 43% and 49% could be obtained without any follow-up attempt other than an invitation letter to encourage responses.^{67,68} In the present study, a follow up reminder by e-mail and postal mail was conducted in an attempt to increase the

response rate, however no incentive was given to complete the questionnaire. In comparison to the present study, which included all hospitals in the SHPA database, Fellows and Hughes⁶⁸ obtained a response rate of 49% from a sample of all hospitals with greater than 150 beds listed in the SHPA database.

In the present study, the questionnaire was sent to all hospitals listed in the SHPA directory (n=299). As shown in table 3.1, the response rate varied from each state between zero (NT) and 73% (WA). Most national studies in which chief pharmacists have been surveyed utilised the SHPA database to obtain the hospital list⁶⁶⁻⁶⁸ as it is generally accepted that the SHPA database comprises all hospitals with pharmacy departments. As a comparison, the number of hospitals in WA obtained from the Western Australian Health Services Directory web site is 33 hospitals in the metropolitan area and 75 hospitals in the rural area. From these 108 hospitals, 26 (24%) have pharmacy departments and all of these are listed in the SHPA directory. If a similar situation exists in other states, it could be assumed that the SHPA directory covers the majority of hospitals with hospital pharmacy departments in Australia, but there remains a large number of small hospitals with a limited, direct pharmacy service.

Table 3.1 *Responses from each state obtained from chief pharmacists responding to the ADR reporting system survey in Australian hospital*

State	Number of Hospital Surveyed (n)	Number of Responses (n)	State Response Rate ^a (%)
Australian Capital Territory (ACT)	3	1	33
New South Wales (NSW)	104	39	38
Northern Territory (NT)	5	0	0
Queensland (QLD)	51	22	43
South Australia (SA)	17	12	71
Tasmania (TAS)	6	2	33
Victoria (VIC)	87	37	46
Western Australia (WA)	26	16	73
	299	129	

^a Response Rate (RR) from each state calculated from number of existing hospitals in SHPA database. Hospitals with more than one site were considered as one hospital as stated by the chief pharmacist

3.1.2. Demographic Data

The demographic data and the descriptive statistics for the hospitals are presented in Table 3.2 and Table 3.3. The majority of hospitals were teaching hospitals classified as acute care/general. Hospitals described as “acute care/general and other specialities” were categorised as acute care/general. A substantial proportion of the hospital respondents were small hospitals with less than 100 beds (23.3%) and this is a group of hospitals that typically have been excluded from recent national surveys. Respondents in previous studies in the UK^{37,38} were larger hospitals compared to the Australian hospitals in the present study.

Table 3.2 Hospitals demography

	% Respondents (n=129)
Hospital type	
Teaching	45.0
Non teaching	38.8
Private	10.9
Base Hospital	1.6
Others	2.4
Not stated	1.6
Hospital description	
Acute Care/ General	82.9
Psychiatric	3.1
Women and Children	3.9
Palliative care	2.3
Sub-acute hospital unit & psychogeriatric	3.9
Others	4.0
Number of beds	
< 100	23.3
100 – 199	34.9
200 – 299	15.5
300 – 399	8.5
400 – 499	6.2
≥500	10.9
Not stated	0.8

A large number of hospitals did not provide data on patient admissions in 2000 (Table 3.3) either because the chief pharmacist was unable to retrieve the admission data or because data on patient admissions were based on the financial calendar. A substantial number of pharmacy departments had three pharmacists or less (51.9%) and two clinical pharmacists or less (48.9%). In a pharmacy department with a small number of pharmacists and clinical pharmacists with respect to the hospital size, ADR reporting might be a difficult exercise due to time constraints.

Table 3.3 *Descriptive statistics of hospitals responding to the survey to chief pharmacists*

(n=129)	Response (n)	Range	Median
Patient admission in 2000	81	240 – 113220	14815
Number of pharmacist(s)	128	0.1 – 50	3.0
Number of clinical pharmacist(s)	108	0.0 – 22	2.0

3.1.3. Written ADR Reporting Policy

Results show that 60% (77/129) of hospitals had a written ADR reporting policy whilst 40% (51/129) of hospitals did not have an official ADR reporting policy.

Furthermore, 67% of chief pharmacists stated that the pharmacy department had a written ADR policy. Although most pharmacy department policies were not different to hospital policies, 11% of chief pharmacists indicated that the pharmacy department policies were more detailed than hospital policies.

Reasons for the lack of a written policy as stated by the chief pharmacists were:

- ◆ Low levels of pharmacist staff
- ◆ Policy was being rewritten/developed
- ◆ The SHPA standards in ADR management³⁰ were followed
- ◆ A formal policy considered to be unnecessary

- ◆ The use of the 'blue card' was encouraged
- ◆ The hospital's incident reporting policy was utilised

Most chief pharmacists who stated that their hospital did not have a written policy encouraged health professionals to report ADRs to ADRAC utilising the 'blue card'. However, a formal policy to prevent the occurrence of ADRs, including re-exposure, is important to establish a system in the management of ADRs. Hospitals without written ADR policies could adopt the SHPA guidelines in ADR management as their ADR policy. As described in section 1.5 the SHPA has a standard for ADR management³⁰, including:

- ◆ The procedure for detection and prevention of ADRs
- ◆ The type of data collected as part of the assessment of the ADRs
- ◆ The criteria to define the correlation of the ADRs and the suspected drug
- ◆ Important issues related to the management of the ADRs
- ◆ The documentation and prevention of ADRs

3.1.4. Factors Associated with the Existence of the ADR Reporting Policy

In the present study, there was no association between hospital size and the existence of the ADR reporting policies (Table 3.4, $\chi^2=2.9$, $p=0.4$). In a previous study in the UK³⁸, the existence of ADR policies was associated with larger hospitals ($p<0.001$).

There was no association between the number of pharmacists and the existence of a pharmacy department's ADR reporting policies (Table 3.4, $\chi^2=4.37$, $p=0.10$). However, a previous study in the UK found an association between the ADR scheme and the total number of pharmacists ($p=0.003$).³⁸ Differences in the sample size, the selection criteria of the hospitals involved and the size of the hospital may have contributed to the different results obtained from the present study. In the UK study, the sample size was smaller and the selection criteria were not reported.³⁸ Hospital sizes varied from up to 400 beds to more than 1200 bed hospitals³⁸ while in

the present study, respondents ranged from small hospitals (less than 100 beds) to large hospitals of more than 500 beds, which mostly would fall under the criteria of a small hospital in the UK study.

Table 3.4 *Factors associated with the existence of ADR reporting policy in hospitals and in pharmacy departments*

Factor	χ^2 value	p value
Hospital size (number of beds) ^a	2.9	0.4
Number of pharmacist(s) ^b	4.6	0.1

^a Association between hospital size and the existence of hospital ADR reporting policy

^b Association between number of pharmacists and the existence of ADR reporting policy in a pharmacy department

In the hospitals without departmental ADR policies, there is a wide range of the number of pharmacists. From those hospitals, 20 had two or less pharmacists while the rest had 3 to 26 pharmacists. Time constraints due to a limited number of pharmacists was not consistent as some larger hospitals with a larger number of pharmacists did not have ADR reporting policies.

3.1.5. Drugs Targeted

In the present study, the following categories of drugs were identified as targets for ADR reporting within the hospital.

- ◆ All drugs (85.3%, n=110)
- ◆ New drugs (5.4%, n=7)
- ◆ The ADRAC list of “Drugs of Current Interest” (1.6%, n=2)
- ◆ Other: reaction that lead to death, danger to life, hospital admission, prolonged hospitalisation or birth defect (0.8%, n=1)

There were 3.1% (n=4) of hospitals in which it was stated there were no specific drugs targeted since they did not have a policy of ADR reporting, while 3.9% (n=5) of hospitals did not provide an answer. Most hospitals targeted all drugs for ADR

monitoring (including new drugs and drugs of current interest from ADRAC). In hospitals without a written policy it was either indicated that all drugs were targeted or no drugs were specifically targeted. The ADRAC encourages all reactions to be reported, however minor. Realistically, health professionals are expected to report the unusual and severe reactions including reactions resulting in death, significant morbidity, extensive and expensive investigations, significant absence from productive activities or commonly accepted drug interaction.⁶⁹

Trick⁷⁰ argued that one of the reasons for underreporting of ADRs was the over-restricted definition of ADRs which precludes many reactions from being reported. He suggested the establishment of two definitions, one which is less discriminating for the purpose of reporting by health professionals and another more refined definition for the purpose of evaluation by an interdisciplinary committee. However, there was no evidence that a less restrictive definition of ADRs compared to the ADR definition given by WHO resulted in a better quality and quantity of reporting. Moreover, two definitions of ADRs could not be used in hospitals that have spontaneous reporting alone, especially for small hospitals.

3.1.6. Documentation of ADRs

The survey included questions to obtain details of the ADR reporting system. The documentation methods of ADR reporting are presented in Table 3.5. Most hospitals (n=66) and pharmacy departments (n=69) stored the ADR information in the form of copies of the 'blue card'.

A drug alert is important as part of the ADR documentation and the most widely used drug alert is a self adhesive label on the medication chart and medical records. Discharge medication card, patient wristband and patient computer profile were used by a smaller proportion of respondents. Results show that drug alert stickers or other equivalent alerts were to be attached by doctors, pharmacists, nurses, medical records staff and ward clerks. Most hospitals assigned doctor, pharmacist and nurse together (24.2%) to attach the alert, while in other hospitals, nurses alone (14.1%) were responsible for attaching the alert. It would be more efficient to have

more than one health professional category to attach the drug alert. However, it is important to have someone responsible for reviewing the process as there is always the risk of omission when too many people are responsible for such tasks.

Table 3.5 Documentation of ADR reports in hospitals and pharmacy departments

(n=129)	% Yes	% No
Copy of ADR records kept in hospital	79.8	17.1
Cards (n=11)		
Computer records (n=19)		
File (n=1)		
Drug and Therapeutic records (n=4)		
Patient clinical records (n=17)		
Copy of 'blue card' (n=66)		
Hospital ADR report (n=2)		
Hospital ADR form (n=3)		
Incident report form (n=3)		
Form MR 177 (n=2)		
Not stated (n=6)		
Copy of ADR records kept in pharmacy department	76.0	22.5
Cards (n=12)		
Computer records (n=22)		
Drug and Therapeutic files (n=1)		
Patient clinical records (n=3)		
Copy of 'blue card' (n=69)		
Hospital ADR report (n=3)		
Hospital ADR form (n=5)		
Incident report form (n=2)		
Form MR 177 (n=2)		
Not stated (n=6)		
Drug alert stickers or equivalent	77.5	20.2
Medication charts (n=88)		
Medical records (n=79)		
Discharge medication cards (n=2)		
Patient wristband (n=4)		
Computer profile for patients (n=1)		

3.1.7. Active Screening of the Suspected ADRs

A small proportion of respondents employed active methods of detection of the suspected ADRs through screening of drugs associated with the occurrence of ADRs (7.8%, n=10) and screening of laboratory results that indicated an episode of ADR (6.2%, n=8) as presented in Table 3.6. Three hospitals employed both active methods. Of the hospitals which screened laboratory results for detection of ADRs, none gave detailed information on which results they use for identification of the suspected ADRs.

Table 3.6 Active methods of identification of the suspected ADR

Method*	Yes	No
'Triggers' to identify suspected ADRs:	7.8 % (n=10)	89.9% (n=116)
Antihistamines (n=5)		
Antidotes (n=3)		
Steroids (n=2)		
Discontinued drug used (n=1)		
Calamine lotion (n=1)		
Adrenaline (n=1)		
Enoxaparin related incident (n=1)		
Screening of laboratory results:	6.2% (n=8)	90.7% (n=117)
Microbiology (n=3)		
Drug assays (n=7)		
Hematology (n=6)		
Biochemistry (n=5)		

* Three hospitals employed both active methods, i.e. use multiple triggers as well as multiple laboratory tests. Other hospitals might use multiple triggers or multiple laboratory results.

3.1.8. Personnel Involved in ADR Reporting

Personnel responsible for the first detection of the suspected ADRs and the categories of health professionals who were encouraged to report ADRs either to the hospital or directly to ADRAC are presented in Table 3.7.

The overall responses showed that nurses have a low involvement in ADR reporting in the hospitals surveyed. Furthermore, doctor alone and pharmacist alone also accounted for a small proportion of hospital respondents. It is notable that the present study and previous investigations have been conducted in selected institutions. In the present study, the survey was sent to all hospitals with a pharmacy department, which may include the majority of acute care/general hospitals. However, a large number of smaller hospitals were not surveyed, particularly those in regional centres, which have a limited range of allied health staff. In these hospitals, nurses would have responsibility for reporting ADRs.

Table 3.7 *Health professionals responsible for the notification of ADRs when it first becomes apparent and who were encouraged to report ADRs either to hospital or to ADRAC according to chief pharmacist respondents*

Personnel	First Notification of ADRs (% responses)	Reports ADR in the Hospital or to ADRAC (% responses)
Doctor	9.3	6.2
Nurse	1.6	0
Pharmacist	3.9	1.6
Doctor & nurse	3.1	3.1
Doctor & pharmacist	20.9	1.6
Nurse & pharmacist	0.8	1.6
Doctor, nurse & pharmacist	56.6	78.3
Doctor, nurse, pharmacist & others	0.8	5.4

A study by Smith *et al*⁷¹ found that nurses detected 49.4% (702 reactions) of ADRs in a study of an ADR scheme in one hospital in the UK during a three year period. Pharmacists detected 44.7% (635 reactions) of ADRs, with 465 reactions detected

by a designated 'ADR pharmacist', and doctors detected 5.9% (n=83) of ADRs. From the ADRs detected by nurses, pharmacists and doctors, 27% (189/702), 38% (240/635) and 58% (48/83) of reports, respectively, were considered appropriate to be reported to CSM, thus prompting the authors to suggest that reports by doctors were of a more serious nature than others.⁷¹ It may be concluded that allowing nurses to become involved, together with doctors and pharmacists, probably would result in a higher number of reports. However, to improve efficiency in reporting, nurses knowledge in ADR reporting would need to be reviewed.

In the present study, ADR reporting was centralised in 61.2% (n=79) of hospitals. The collection of ADR reports was mostly done by "pharmacist alone" (92.3%, n=72) while doctor alone, nurse alone and both pharmacist and nurse together accounted for 2.6% (n=2). Hospitals that did not utilise a centralised reporting system allowed health professionals to forward the ADR 'blue card' to ADRAC independently. Most of the hospitals stated that both doctor and pharmacist together were responsible for forwarding the ADR 'blue card' to ADRAC (45.5%, n=20). However in some hospitals, doctors alone were responsible for forwarding the ADR 'blue card' (22.7%, n=10) followed by pharmacists alone (13.6%), nurses alone (2.3%), combination of doctor, pharmacist and nurse (9.1%). Hence, these data demonstrated that hospitals aim to utilise a multidisciplinary approach to ADR reporting. Improving nurse and pharmacist knowledge in ADR reporting and increasing doctors' interest in ADR reporting, would likely enhance both the quality and quantity of ADR reports.

3.1.9. Pharmacy Department's Involvement in Hospital's ADRs Reporting System

Training/information sessions in ADRs for new pharmacists was provided by 53 (41.1%) pharmacy departments. The information given was mostly an explanation of the hospital or/and pharmacy department policy in ADR reporting (86.5%, n=32). The main reason cited by pharmacy departments that did not provide information sessions in ADR reporting on the commencement of the new pharmacist was that there had been no new pharmacists commencing work for a long period of time, therefore no information session had been necessary.

3.1.10. ADR Reports to ADRAc in 2000

The involvement of hospital and pharmacy department in the ADR reporting scheme through ADR reports submitted to ADRAc in 2000 are summarised in Table 3.8. The responses presented in Table 3.8 were the number of reports submitted to ADRAc in 2000 according to the chief pharmacists. The claimed number of ADR reports submitted to ADRAc in 2000 was then compared with data obtained from ADRAc (Table 3.9).

Table 3.8 *Number of ADR reports submitted to ADRAc in 2000 according to chief pharmacist from each hospital*

Number of reports	% of Hospitals which Submitted Reports According to Chief Pharmacist (n=129)	% of Pharmacy Departments which Submitted Reports According to Chief Pharmacist (n=129)
None	14.0 %	24.0 %
1 – 5	24.0 %	28.7 %
6 – 10	8.5 %	7.8 %
11 – 20	6.2 %	10.1 %
more than 20	12.4 %	12.4 %
don't know	29.5 %	12.4 %
not stated	5.4 %	4.7 %

Data provided by chief pharmacists and ADRAc regarding the number of ADR reports submitted to ADRAc (Table 3.9) were statistically different (χ^2 , $p < 0.001$). There were 30.8% of chief pharmacists who did not know how many reports were submitted by the hospital, and 6% did not respond. In overall number, the reports received by ADRAc in 2000 were higher than the number of reports according to chief pharmacists. More than 50% of hospitals submitted between zero and five ADR reports to ADRAc in 2000 (Table 3.9). Data from ADRAc indicated a median of 2.5 and range of 0–362 reports from the hospitals which approved release of the data. The difference in these results is probably related to doctors forwarding reports to ADRAc without notifying the hospital or pharmacy department, including the hospitals with a centralised reporting system. However these results also

showed that many chief pharmacists did not have ready access to the information on the number of reports submitted either by the hospital or by the pharmacy department.

Table 3.9 Comparison of ADR submissions to ADRAC in 2000 obtained from chief pharmacist and from ADRAC

Number of reports	% of Hospitals which Submitted Reports According to Chief Pharmacist ^a (n=104)	% of Hospitals which Submitted Reports Obtained from ADRAC ^{b,c} (n=104)
None	9.6 %	21.2 %
1 – 5	26.0 %	41.3 %
6 – 10	8.7 %	9.6 %
11 – 20	4.8 %	11.5 %
more than 20	14.4 %	16.3 %
don't know	30.8%	-
not stated	6.0%	-

^a Data were the response from chief pharmacists from hospitals which gave permission to obtain data of ADR reports submission to ADRAC in 2000.

^b Data was provided by ADRAC with written permission from chief pharmacist of each hospital. There were no data from ADRAC in 26 hospitals (20.2%) because chief pharmacist did not provide approval to retrieved data from ADRAC

^c Number of reports obtained from ADRAC were significantly higher than the number of reports according to chief pharmacists (χ^2 , $p < 0.001$)

Reporting rate was calculated from the number of reports received by ADRAC in 2000 divided by the number of patient admissions in 2000. There was sufficient information to determine the reporting rate for 79 hospitals, since there were only 104 sets of data for the number of reports from ADRAC and from those 104 hospitals, 25 did not provide the number of patient admissions in 2000. A median reporting rate of 0.02% (range 0–1.09) was obtained and there were 7.1% of hospitals with a reporting rate of zero (no reports submitted to ADRAC in 2000).

A study of fifteen Melbourne hospitals in 1991 found that the reporting rate was 0.02% to 0.72%.³³ Respondents' inpatient admission in this study ranged between 11 182 and 45 680 patients per year.³³ The size of hospitals were not available in the previous study, therefore patient admission was used instead to compare respondents. In comparison, the present study shows a wider range of reporting

rates and the inpatient admission range was between 240 and 113 220 patients per year. Respondents in the present study covered a wider range of hospital size, and from the inpatient admissions it could be seen that a spread of smaller and larger hospitals were involved in the survey. In general, it may be suggested that these data have shown little improvement in reporting rates since 1991.

3.1.11. Follow Up Action

Follow up action on ADR reporting has not been done in 6 (3.2%) hospitals. In most of the hospitals, the ADR reporting was followed up by action including:

- ◆ altered prescription habit (23.2%, n=44)
- ◆ formulary alteration (4.2%, n=8)
- ◆ information sheets/drug bulletin (25.3%, n=48)
- ◆ cost saving (1.6%, n=3)
- ◆ regular reporting to Drug & Therapeutics Committee (38.4%, n=73)

There was no further explanation as to how to alter the prescription habit in the hospital. Other follow up actions stated included change in imprest availability, surveys in drug related hospital admission, report to medical quality committee, report to pharmacy advisory committee, review as part of clinical management program and lastly, possible inclusion in monthly report to the hospital board meeting. Most hospitals stated that there was a follow up action in the hospital, but there was no further clarification as to the extent of the follow-up action. Further study is needed to clarify the extent and the impact of the follow-up action.

3.1.12. Preventive Action

Prevention of ADRs including method of assessing the prevention of ADRs and assessing cost of ADRs has not been implemented by most of the respondents. Only 17.8% (n=23) of hospitals assessed prevention of ADRs and none of the respondents assessed cost of ADRs.

Methods of assessing ADRs prevention described by respondents were the following:

- ◆ Special drug targeted e.g. warfarin, gentamicin
- ◆ Review of clinical history in medication chart
- ◆ Drug alert sticker from previous reaction
- ◆ Database of reporting
- ◆ Pharmacists discussion to prevent recurrence
- ◆ ADR Committee comprising clinical pharmacists and medical scientist
- ◆ Current PhD project underway
- ◆ Multidisciplinary ADR Committee discussion every month
- ◆ Categorised the suspected ADRs (e.g. possible, probable, etc) lead to recommendation for future use.
- ◆ Proactive and reactive measures in response to ADR

The preventive action for ADRs was not a key focus of the present study, however further study in assessing prevention may be warranted.

3.1.13. Information Regarding the Occurrence of ADRs Given to Patient, General Practitioner and Community Pharmacist

After the ADR had occurred, patients, GPs and sometimes the community pharmacists would be informed (Table 3.10).

Table 3.10 Information regarding of the incidence of ADRs

(n=129)	Yes (%)	No (%)	Don't know (%)
Informed the patients*	95.5	2.3	0.8
Reporting ADRs to patient's General Practitioner (GP)*	88.6	5.4	3.1
Reporting ADRs to patient's community pharmacists*	10.9	85.3	1.6

* There were some respondents who did not provide answer

Patients were mostly advised in regards to the ADR by the doctor alone (41.9% respondents), followed by doctor, pharmacist and nurse (29.5% respondents). The doctor and pharmacist advise patients in 15.5% of the hospitals while 2.3% of respondents stated it was not done. The patients were informed verbally (70.9%, n=117), by card (13.3%, n=22), through a letter (10.3%, n=17) and via the GP (1.2%, n=2). Verbal information given to the patients is probably best accompanied by written information, as patients need to be able to recall the information in the future.

The majority of hospitals (88.6%, n=116) had a procedure for reporting ADRs to the patient's GP, compared to a study in UK hospitals (section 1.7) in which only one hospital (of 153 surveyed) had a procedure for notifying the GP.³⁸ The difference in the result obtained from the present study cannot be explained from the available data.

In the majority of cases the GP was notified by the hospital doctor (56%, n=73). In some of the hospitals, the GP (4.7%, n=6) was the Visiting Medical Officer (VMO), therefore the GP does not need to be notified regarding the occurrence of ADRs. Other personnel responsible for notifying the GP were pharmacist, nurse, patient, ADR Committee, Medical Director and different combinations of these personnel accounting for 0.8% to 6.2% of respondents. There were 3.1% (n=4) of chief pharmacists who did not know who was responsible for notifying the GP in their hospital and 5.4% (n=7) of hospitals did not notify the GP. Methods employed to notify GPs included discharge summary (54%, n=90), letter (20%, n=33), via patient (11.5%, n=19) and card (0.6%, n=1). The validity of information given through a patient to their GP is questionable. Hence it would be best to send written information to the GP to prevent any misleading information.

A small number of hospitals informed the community pharmacist in regards to ADR incidence, in comparison with none in a previous UK study³⁸ discussed in section 1.7. Fourteen hospitals (10.9%) informed the community pharmacists, the information given through letter (n=3), telephone (n=5), copy of ADR summary (n=2), medication card supply on discharge (n=3), card (n=1) and via patients (n=1).

3.1.14. Feedback and Reward for Reporting ADRs

Feedback and rewards for health professionals provided by hospitals are summarised in Table 3.11.

Table 3.11 Summary of feedback and rewards for reporting ADRs in hospital

(n=129)	Yes (%)	No (%)	Don't know (%)
Is feedback provided by the hospital?*	22.5	74.5	0.8
Should feedback be provided by the hospital?*	79.1	14.7	1.6
Is general feedback provided by the hospital?*	62.0	37.3	0.7
Is reward provided by the hospital?*	13.2	86.0	N/A
Should reward be provided by the hospital?*	31.0	65.1	N/A

* There were some respondents who did not provide answer

Table 3.11 shows that most chief pharmacists believed that feedback for individuals who report ADRs and general feedback for all staff is important. However, only a small proportion of hospitals provide feedback. Feedback would contribute to the increased awareness of ADRs and could improve the quality and quantity of ADR reports.

Feedback forms for individuals reporting ADRs in the hospital included individual letter, pre-printed letter, personal feedback, copies of ADR report, pharmacy committee bulletin, and feedback given during clinical meeting. Moreover, chief pharmacists believed that feedback through letter, e-mail, verbal, receipt of the ADR reports and presentations in bulletins were the appropriate forms of feedback.

General feedback methods for health professionals provided in the hospital included bulletin board, drug bulletin, ward report, presentation in a meeting, newsletter, quarterly review of hospital activities, pharmacy web page and e-mail alert. General feedback considered appropriate by the respondents were feedback through drug bulletin, bulletin board, presented in hospital meeting, ward reports, intranet, and e-mail.

Only 13.2% of hospitals presented a reward/fee to health professionals who submitted ADR reports. By comparison, 31% of chief pharmacists suggested that a reward/fee is necessary. The forms of reward included chocolate frogs (n=15) followed by ADR pen, thank-you letter and movie ticket (in a total of 5 hospitals). A previous intervention study in one Finnish hospital (section 1.6) included a free dessert at the employee cafeteria as a form of incentive for reporting ADRs.³⁵ The results showed a marked improvement in the number of ADR reports within one year of study period (53%), however it is not known whether the improvements were due to the incentive or other interventions.³⁵ The correlation between reward/fee and the reporting rate; and the opinion of doctors and pharmacists regarding reward/fee in reporting ADRs is outlined in section 3.1.15 and 3.2.7.

3.1.15. Factors Associated with Reporting Rates

Factors found to have association with the reporting rate were analysed using a General Linear Regression Model, Univariate Anova and the results are presented in Table 3.12. The reporting rate was presented previously in section 3.1.10, and hospital descriptions are categorised into two categories, acute care/general and others.

Table 3.12 Factors associated with ADR reporting rate obtained from ADR reports submitted to ADRAC in 2000

Factor	p value
ADR policy in hospital	0.77
Centralised system	0.29
Feedback	p < 0.001
Reward	p < 0.001

The existence of an ADR policy and a centralised system did not show association with the reporting rate. By contrast, Ferguson and Dhillon³⁷ found ADR procedure to

be associated with the number of reports, however they only used number of reports and did not take into account number of patient admissions or hospital size.

In the present study, the ADR policies in five hospitals with a reporting rate range from 0.25% to 1.09% was examined, as well as one hospital with 157 ADR reports. The reporting rate of the latter hospital was not available because data on the number of patient admissions was not provided by the chief pharmacist. There were three hospitals without ADR policies that had a reporting rate of 0.25% (37/14 815 and 283/113 220), and 0.31% (98/32 000). The reason behind the non-existence of an ADR reporting policy in those hospitals as quoted by two of the chief pharmacists were:

- ◆ 'There has not been a perceived need'
- ◆ 'Never finished, only ever in a draft form'

The hospital with a reporting rate of 1.09% (12/1102) implements the spontaneous reporting system as described in section 1.5.1. In this hospital, the system is centralised in the pharmacy department. Doctors verify ADR reports and document the ADR in the patient's medical records, attach a drug alert sticker to the drug chart and in the cover of patient's medical history, complete the 'blue card' and forward it to the pharmacy department. The pharmacy department records the ADR in a hospital record, forwards the 'blue card' to ADRAC, and makes regular reports of ADRs to the Pharmaceutical Advisory Committee.

The hospital with a reporting rate of 0.55% (362/65 580) implements the notification system (section 1.5.2) combined with the active seeking of ADRs (centralised in pharmacy department). When an ADR is suspected, the doctor, nurse or pharmacist could fill in the blue card directly and send it to the pharmacy department or report the ADR via the pharmacy telephone hotline. An alert wrist band is attached by nurses, as well as the appropriate documentation in the nursing care plan. Documentation in medication charts and an 'alert summary sheet' is to be done by a doctor. The active seeking of ADRs is done through three surveillance methods conducted by pharmacists.

- ◆ Surveillance of alerting orders for example, "stat" orders of antihistamines and/or corticosteroids

- ◆ Surveillance of high risk patients for example, paediatric, geriatric, hepatic or renal failure, and multiple drug users
- ◆ Surveillance of high risk drugs for example, warfarin, digoxin, aminoglycosides, phenytoin

Further follow-up done by the pharmacy department includes checking of details, recording the ADR, and making regular reports to the Drug and Therapeutic Committee, TGA, and to forward ADR reports to ADRAC. There is a chocolate frog reward if requested and three monthly prize for ADR reporting.

In the hospital with 157 ADR reports, the notification system is used. The suspected ADR could be reported by leaving a message on a telephone hotline or by completing an ADR reporting form and forwarding the report to the pharmacy department. A pharmacist checks the answering machine regularly and completes the ADR report form. Doctors, nurses and pharmacists can complete the ADR report form which is signed by the responsible doctor. A multidisciplinary ADR Committee reviews the ADR reports and decides whether an ADR alert is needed. A summary of reports is presented at the Pharmacy and Therapeutic Advisory Committee meeting monthly and a copy of the ADR report is forwarded to ADRAC.

The results indicate that the existence of an ADR policy is not adequate to improve ADR reporting rates, as the implementation of the policy is of more important value. A centralised system was implemented in three hospitals out of six, which had a higher reporting rate or number of reports. A centralised system will likely provide ease to the health professionals involved with regards to all the necessary work involved in notifying a suspected ADR. The ADR reporting is mostly a centralised system in the pharmacy department. However, it could be difficult to implement the centralised system in a hospital with a small (or non-existent) pharmacy department and alternative strategies may be required.

Feedback is in accordance with 79.1% of chief pharmacists who believed that feedback is necessary. On the contrary, only 31% of chief pharmacists believed that a reward is necessary to improve the reporting rate. The type of rewards given would also probably influence the reporting rate; however this is difficult to assess since most hospitals surveyed in the present study provided chocolate frogs if a

reward was available. Even though ADRAC has provided individual acknowledgement for ADR reporting, feedback and acknowledgement from the hospital might encourage health professionals to continue reporting ADRs. Especially in a hospital with the centralised system, individual feedback or a form of recognition, needs to be considered. A prospective study of the impact of rewards and feedback on ADR reporting could be a useful extension to this project.

3.1.16. Comments for Improving ADR Reporting

ADRAC has specified the criteria for ADR reporting as presented in section 1.4. However, in the clinical setting it may not be easy to decide whether to report a particular reaction and whether a reaction is related to a certain drug. It would probably be easier to quantify whether a reaction is unusual or severe rather than minor. Information or education on how to define a reaction and the ADR definition would help health professionals to decide when and what to report and thus improve ADR reporting.

A UK study has found that nurses and pharmacists showed a higher interest and involvement in ADR reporting.⁷¹ By contrast, doctors showed lower involvement but provided higher quality of reports.⁷¹ To enhance the number and quality of ADR reports, it would be worthwhile to improve nurses' and pharmacists' critical appraisal of ADR reports through education and promotion, as well as doctors' interest and involvement in ADR reporting. Therefore, it is important to find factors that would encourage and discourage health professionals from reporting ADRs. Furthermore, a strategy for improving ADR reporting could be a centralised system with designated ADR personnel who screened, collated, documented and forwarded reports to ADRAC. Even though a centralised system was found to have no correlation with the reporting rate in the present study, this finding is contrary to a recent study in the UK³⁷ and this option may not be suitable for small hospitals with limited resources. Alternative strategies that could include designated ADR personnel also should be evaluated.

Educational improvement has been investigated in many of the studies and shown to contribute in improving the ADR reporting.³⁴⁻³⁷ However in the present study only feedback has been considered. Feedback could be taken as part of the educational program, especially the general feedback provided to all health professionals in the hospital. The form of education covered by previous studies discussed in section 1.6 were information through direct mailing, a regular article in the local periodicals, presentation in clinical meetings, training within the hospital or pharmacy department and training provided by an external organisation.³⁴⁻³⁶ Continuing education covering ADRs could be of value to help health professionals identify and report suspected ADRs and therefore improve the quality and quantity of ADR reports. However, evaluation of the features or the existence of continuing education or other forms of education related to ADRs in Australia was beyond the scope of the present study.

Active promotion also is a key component of ADR policies in some hospitals (section 1.5 and 1.6) and may include regular reminders and advertisements, as well as promotion for the reward given.^{35,36} The active promotion may also include the educational programs, including presentations to doctors, regular presentation in the local periodicals, and direct mailing of ADR related information. The active promotion as part of other attempts to improve the quantity of reports has been proven to result in a higher number of reports.³⁴⁻³⁶ Thus it would appear to be important to maintain some form of active promotion to ensure that the quality and number of reports is maintained or improved.

3.2. Adverse Drug Reaction Reporting Surveys to Doctors and Hospital Pharmacists

3.2.1. Response Rates

3.2.1.1. Doctor

Questionnaires were sent to 803 doctors and returned by 277 (35%), of which 32 (4%) of them had changed addresses. Therefore only 245 (31%) respondents were included in the analysis.

A response rate of 35% has been categorised as an expected response rate.⁶¹ Higher response rates are achievable with various follow up strategies, for instance follow up reminder and rewards. There was neither follow up nor rewards given to respondents in this study. The attempt to increase the response rate was solely based on the design of the questionnaire.

Response rates obtained by surveys (with comparable methods) of doctors ranged between 44% and 64%.⁷²⁻⁷⁵ Response rates of 44% (47/106), 55% (51/104) and 64% (488/800) were surveys of GPs in New South Wales⁷², in Adelaide⁷³ and in Victoria⁷⁴ whilst the response rate of 61% (161/265) was a survey of radiation and medical oncologists in Australia.⁷⁵ There was a follow up reminder in three of the surveys⁷³⁻⁷⁵ and an incentive in the form of movie tickets for the second survey.⁷³ The nature of the surveys was different since respondents of the previous surveys were specific categories of doctors. By contrast, the present study surveyed all doctors working in the selected hospitals.

3.2.1.2. Hospital Pharmacist

Questionnaires were sent to all SHPA members in Australia, not all of whom are practising hospital pharmacists, and all identifiable hospital pharmacists in WA. Questionnaires were returned by 574 (43%, n=1323) recipients. A total of 109 responses (8%) were excluded from full analysis in the study for various reasons including 104 (8%) who stated that they were no longer working in hospital

pharmacy, one pharmacist had changed address, and another 4 were non-respondents who returned the questionnaire. Therefore, 465 (35%) were included in the analysis along with 39 (3%) pharmacists who were not working in hospital and filled in the hypothetical questions on ADRs in Section C of the questionnaire (Appendix 4).

The low response rate could have been because not all SHPA members are hospital pharmacists. From the SHPA 2000 membership survey, the proportion of members who were not working as a hospital pharmacist was 26%.⁷⁶ Furthermore, it was found from the list of SHPA members in WA that 22% were not working as a hospital pharmacist. Therefore, it could be estimated that 22% – 26% of the SHPA members were not working in the hospital setting, many of whom may not have replied to the survey. Indeed, only 8% of the respondents stated that they were not working in hospital pharmacy.

A previous survey of hospital pharmacists in WA obtained a response rate of 52% (72/135).⁷⁷ The questionnaires were sent to clinical and non clinical pharmacists working in state and federally funded hospitals in WA and follow up letters to improve responses were used. Response rates obtained by two earlier studies surveying hospital pharmacists in the UK were 53.7% and 63%.^{8,41} Both studies did not cover all hospital pharmacists in the UK, and reminder letters had been sent out in an attempt to increase the response rate. Due to the anonymous nature of the survey, no reminder letters were sent out in the present study.

The proportion of hospital pharmacists in Australia who are not members of SHPA is unknown. From data provided by chief pharmacists responding to the earlier survey (section 3.1), in WA there were 195 pharmacists classified as hospital pharmacists, 87 of whom were not listed in the SHPA directory and 108 who were SHPA members. If a similar proportion applied in all states, SHPA members would represent approximately 55% of hospital pharmacists in Australia. Therefore, based on the response rate, results of this study covered approximately 25% of the total hospital pharmacists in Australia. By comparison, the respondents from the UK studies in hospital pharmacists' attitudes and knowledge in ADR reporting represented 5% and 7% of the total hospital pharmacist population respectively.^{8,41}

3.2.2. Demographic Data

3.2.2.1. Doctor

The demographic results and the descriptive statistics for the participating doctors are shown in Table 3.13 and Table 3.14.

Table 3.13 Gender of doctor respondents

Gender	Response*	
	n=245	%
Female	54	22
Male	187	76

*There were 4 respondents who did not provide answer

Table 3.14 Years registered and practice in hospital of doctor respondents

	Median	Min	Max
Year(s) registered	15	0.5	60
Year(s) in hospital practice	12	0.1	48

The current area of practice in the hospital and the status of doctors are presented in Figure3.1 and Figure3.2.

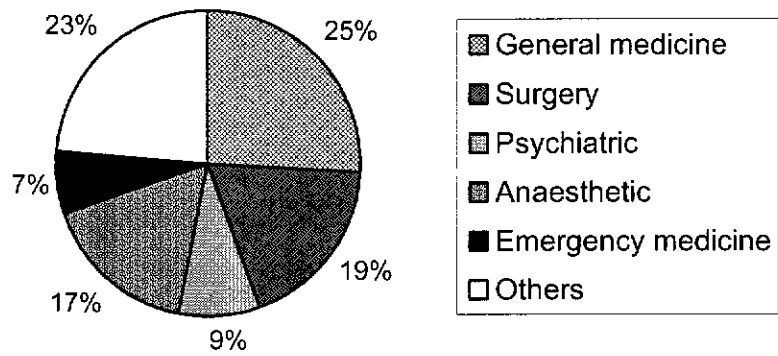


Figure 3.1 Current area of practice in hospital of doctor respondents

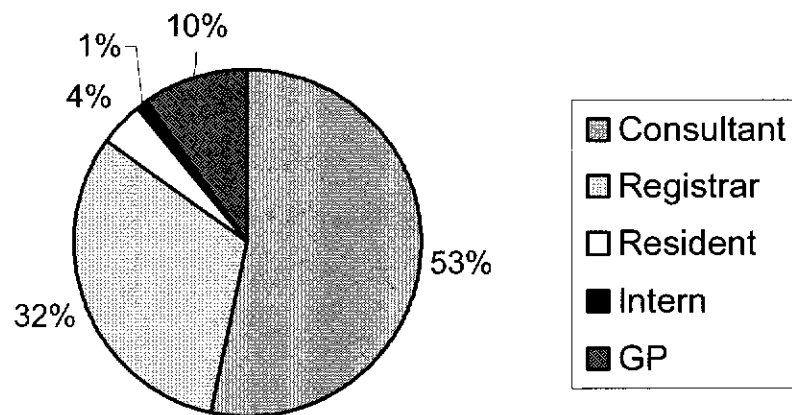


Figure 3.2 The status of doctor respondents

Questionnaires were sent to 174 (52%) consultants, 93 (28%) registrars, 44 (13%) residents and 26 (8%) interns at FHHS compared to the proportion of the returned questionnaire of 59%, 36%, 4% and 1% respectively. Based on FHHS data and the fact that more consultants were invited, the proportion of consultant respondents was an over-representation of the sample while the number of residents and interns was an under-representation. Low numbers of residents and interns responded to the questionnaire and this may be a reflection of their low interest in ADR reporting. In fact, residents and interns interact more often with patients in the ward therefore they should have a higher chance to encounter suspected ADRs. Improving junior medical staff knowledge and interest in ADR reporting would probably improve the rate and quality of ADRs reported.

3.2.2.2. Hospital Pharmacist

The demographic data and the descriptive statistics for the participating hospital pharmacists are presented in Table 3.15 and Table 3.16.

Table 3.15 Gender of hospital pharmacist respondents

Gender	Response	
	n (n=465)	%
Female	318	68.4
Male	147	31.6

Table 3.16 Years registered and years of practice in hospital of hospital pharmacist respondents

	Median	Min	Max
Year(s) registered ^a	18	0.67	60
Year(s) in hospital practice ^b	14	0.3	50

^a 11 pharmacist respondents did not provide answer

^b 5 pharmacist respondents did not provide answer

The areas the pharmacists work in are presented in Figure 3.3. Fifty percent of hospital pharmacists described their current area of work as clinical pharmacist and a further 9% of pharmacists were working in multiple areas in hospital. The clinical pharmacists are more likely to encounter ADRs because of the clinical exposure, however others might have some clinical exposure and could contribute to ADR reporting.

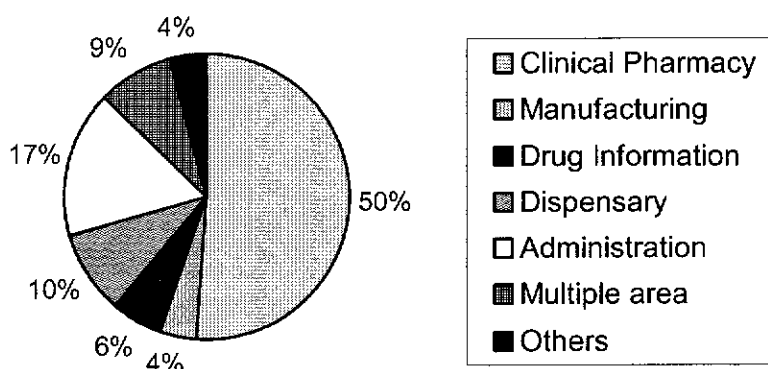


Figure 3.3 Main activities in hospital of hospital pharmacist respondents

'Others' included clinical trials (n=5), education (n=1), regulatory (n=1), management (n=1), consultant pharmacist/medication review (n=2), poison's information (n=3), DUE/Drug Committee (n=1), military (n=1), project work (n=1).

3.2.3. Knowledge and Attitudes Toward ADR Reporting

Knowledge of doctors and hospital pharmacists in how to report ADRs within the hospital and to ADRAC is summarised in Table 3.17. Respondents who did not know how to report ADRs within the hospital and to ADRAC were not required to fill in section B of the questionnaire (Appendix 4) but they were requested to complete

section C (ADR hypothetical questions, see section 3.2.10). A total of 60 doctors did not fill in section B, while only 4 hospital pharmacists did not complete section B.

Table 3.17 Knowledge of hospital pharmacist and doctor respondents in how to report ADR within the hospital and to ADRAC

	Doctors (n=245)	Pharmacists (n=465)	χ^2 ^b
	Yes	Yes	
ADRs reports within the hospital	64 %	96 %	p < 0.001
ADRs reports to ADRAC ^a	57 %	98 %	p < 0.001

^a 5 pharmacist respondents did not provide answer

^b χ^2 comparing doctors and hospital pharmacists responses

Table 3.18 The ADR information and the type of information given during the commencement of employment in hospital to respondents

Respondent	ADRs information given to respondents			Types of information ^a
	Yes	No	Don't remember	
Doctors ^b (n=185)	12 % (n=23)	57 % (n=105)	30 % (n=54)	- Written information in medical handbook (n=11) - Written information during orientation program (n=8) - Verbal information (n=8)
Pharmacists ^c (n=461)	51 % (n=233)	33 % (n=150)	15 % (n=72)	- Written information in pharmacy handbook (n=43) - Written information during orientation program (n=45) - Verbal information (n=172) - Written memo (n=1)

^a Some respondents provided more than one type of information

^b There were 3 doctor respondents who did not provide answer

^c There were 6 hospital pharmacist respondents who did not provide answer

A smaller proportion of doctors compared to hospital pharmacists knew how to report ADRs within the hospital and to ADRAC (Table 3.17) and only 13% of all doctor respondents indicated that they had received information regarding ADRs during commencement of employment in the hospital (Table 3.18). The type of information given to doctors regarding ADR reporting might contribute to the lower level of knowledge in how to report ADRs in comparison with hospital pharmacists. From doctors who recalled receiving information, only 8 had received verbal information, whilst others received written information in the medical handbook or during an orientation program. On the other hand, 56% of hospital pharmacists received information and from those, approximately 70% received verbal information. It could be argued that verbal information alone is not very good as there is a strong reliance on memory. However, written information alone also is not sufficient as it may never be read. Further reminders and promotion of ADR reporting would be important as follow up and to maintain interest by health professionals. Written and verbal information only at the commencement of employment may not be sufficient, especially if it is given briefly as part of a comprehensive program.

There were no questions included in this survey to find out whether other forms of education in ADRs were used either by hospitals or pharmacy departments. Ferguson and Dhillon found there was an association between education and increasing number of reports.³⁷ However, the study did not take into account the size of hospital or the number of patient admissions and the correlation with the number of reports. Forms of education included internal training within the pharmacy department and training by external organisations such as a regional Drug Information (DI) centre and Centre for Pharmacy Postgraduate Education (CPPE).³⁷ Previous intervention studies included education as part of interventions in an attempt to improve reporting rate; however the correlation of education alone and reporting rate was not assessed.³⁴⁻³⁶

Table 3.19 Respondents' opinion of the adequacy of the ADR reporting system established in their hospital

Respondents	Current ADRs reporting system		
	Adequate ^a	Not adequate	Don't know
Doctor (n=185) ^b	40 % (n=74)	15 % (n=27)	45 % (n=82)
Pharmacist (n=185) ^c	56 % (n=251)	37 % (n=169)	7 % (n=32)

^a χ^2 , p value < 0.001, between doctors and hospital pharmacists

^b No response from 2 doctor respondents

^c No response from 9 hospital pharmacist respondents

It can be seen from Table 3.19 that a high proportion of doctor respondents (45%) did not know whether the current ADR reporting system in the hospital was adequate, while only 7% of pharmacist respondents did not know. From doctors who answered the particular question, 87% (n=152) knew how to report ADRs within the hospital and 13% (n=23) did not know. Therefore, 32% of doctors knew how to report ADRs in the hospital but did not know whether the system is adequate. This might reflect doctors' low interest in ADR reporting or limited experience with the ADR reporting system. By contrast, from hospital pharmacists who responded to the question, 98% (n=440) knew how to reports ADRs in the hospital. Only 5% of pharmacists who knew how to report ADRs within the hospital indicated they did not know whether the current system was adequate.

3.2.4. Personnel Involved in ADR Reporting

Personnel who should be responsible for documenting ADRs in the hospital and for submitting ADR reports to ADRAC, according to the respondents, are summarised in Table 3.20.

Table 3.20 Personnel who should be responsible for documenting ADR reports in the hospital and submitting ADR reports to ADRAC

Personnel	Documenting ADRs		Submitting ADRs	
	Doctor n=185 (%)	Pharmacist n=461 (%)	Doctor n=185 (%)	Pharmacist n=461 (%)
Doctor	22.2	2.0	25.4	1.6
Nurse	0.6	7.0	0.6	0
Pharmacist	23.3	10.9	39.8	42.0
Doctor & nurse	1.1	0	0	0.2
Doctor & pharmacist	37.8	34.3	29.8	40.6
Nurse & pharmacist	0	0	0	0.2
Doctor, nurse & pharmacist	15.0	51.3	4.4	15.4

Doctor respondents also stated that other health professionals, a team approach, and the patient could be responsible for documenting ADRs. Hospital pharmacist respondents' suggestion included other health professionals, the drug committee, clinical information services/medical records staff, clerical support staff, patient, physiotherapists, clinical pharmacology, pharmacy advisory committee, and administration staff.

Besides the responses presented in Table 3.20 for personnel who should be responsible for submitting the ADR report to ADRAC, hospital pharmacist respondents suggested other personnel responsible for submitting ADR reports to ADRAC could include ADR committee/hospital coordinator, drug committee, and clinical pharmacologist. Doctors suggested other health professionals and a team approach.

The data in Table 3.20 show that a low proportion of doctors and hospital pharmacists thought that nurses should be involved in documenting and submitting ADR reports. Most doctors believed that it is the responsibility of doctor and pharmacist either together or alone to document and submit ADR reports. Hospital pharmacists thought that doctor and pharmacist together and doctor, nurse and pharmacist together should be responsible for documenting ADRs. In submitting

reports to ADRAC, hospital pharmacists thought that it is the responsibility of pharmacist alone (42.0%) or pharmacist and doctor together (40.6%). These results suggest that doctors and hospital pharmacists consider ADR reporting to be their professional responsibility. This apparent sense of “ownership” should be a foundation for improving reporting, but inclusion of nurses also could be fostered (section 3.1.8).

There were 68% (n=125) of doctors and 80% (n=364) of hospital pharmacists who thought that ADR reports should be screened by a designated person before being sent to ADRAC. There is a statistically significant difference between doctor and hospital pharmacist response to this question (χ^2 , $p<0.01$) but these data indicate bilateral support for such a strategy. Designated ADR personnel who screened the reports would mean more resources and time is needed, therefore it may not be suitable for every hospital. It would probably be more efficient for smaller hospitals to leave ADRAC to screen the reports, or for designated personnel to be contracted to screen ADR reports. Importantly, this process would likely increase the quality of ADR reporting and result in improved reporting rates.

Both doctors and hospital pharmacists showed agreement in consulting on ADRs. Most doctors (84.2%, n=154) stated they would consult with a hospital pharmacist; 13.7% (n=25) would not consult and 2.2% (n=4) would consult only when it is necessary (2 did not respond). By comparison, 91.0% (n=415) of hospital pharmacists would consult with the doctor regarding any ADR they encounter, 6.1% (n=28) would not consult and 2.9% (n=13) would consult with doctor only when necessary (5 did not respond).

3.2.5. ADR Reports to ADRAC in 2000

There were 19% of doctors and 54% of hospital pharmacists who recalled submitting ADR reports to ADRAC in 2000 (χ^2 , $p<0.001$). The self-reported number of ADR submissions to ADRAC in 2000 are shown in Table 3.21.

Table 3.21 ADR reports submitted to ADRAc in 2000. The number were the number of reports stated by doctors and hospital pharmacists

Respondents	Number of reports submitted to ADRAc in 2000			
	Total	1	2 to 5	More than 5
Doctor (total), n=185		68 %	29 %	3 %
Consultant	54 %	30 %	21 %	3 %
Registrar	28 %	21 %	7 %	0
GP	16 %	15 %	2 %	0
Pharmacist (total), n=461		19 %	56 %	26 %
Clinical Pharmacist	64 %	13 %	37 %	14 %
Others	36 %	6 %	19 %	11 %

Results show that more hospital pharmacists submitted ADR reports than doctors and also a higher number of reports were submitted by hospital pharmacists. Most doctors had submitted 1 report while most pharmacists had submitted 2 to 5 reports. Pharmacists other than clinical pharmacists also have submitted reports. Previous research shows that doctors prefer to report reactions of a more serious nature compared to hospital pharmacists and nurses.⁷¹ This tendency to report only serious reactions is probably one of the reasons behind the low level of ADR reporting by doctors.

The actual proportion of ADRs reported to ADRAc might deviate from those self-reported results. Non-respondents might report less reports as they probably have less exposure to opportunities, or interest in ADR reporting.

3.2.6. The Availability of the ADR 'Blue Card'

Results on the availability of the ADRAC 'blue card' can be seen in Table 3.22.

Table 3.22 *Doctors' and hospital pharmacists' knowledge in the availability of ADRAC 'blue cards' in hospital. Respondents may answer more than one source*

Source	Doctor		Pharmacist	
	n=185	% of cases	n=461	% of cases
Available in the ward*	2	14.5	139	30.3
Through Pharmacy Department*	139	80.3	435	95.0
PBS book available in hospital**	9	5.2	28	6.1
The Adverse Drug Reactions Bulletin**	4	2.3	6	1.4
<i>Other:</i>				
Don't know	15	8.7	-	-
Doctor's personal supply	14	8.2	1	0.2
Hospital intranet	-	-	16	3.5
Hospital form acceptable to ADRAC	-	-	16	3.5
Ward pharmacist	-	-	1	0.2
Clinical pharmacologist	-	-	2	0.2
Director of medical service	-	-	1	0.2
Drug information department	-	-	1	0.2
Total responses	206	119.1	646	141.0

* χ^2 , $p < 0.001$, between doctors and hospital pharmacist response

** χ^2 , $p > 0.05$, between doctors and hospital pharmacist responses

A high proportion of doctors thought that the ADR 'blue card' was available in the hospital through the pharmacy department (in accordance with hospital pharmacists). Only 14.5% of doctors and 30.3% of pharmacists stated that the form was available in the ward. A form that is easy to access, for instance available in the wards, would be crucial in improving ADR reporting. Other methods that could make reporting easier would be reporting through the hospital intranet as stated by 3.5% of hospital pharmacists.

The ADRAC 'blue card' is actually available through several sources including²⁷:

- ◆ The Adverse Drug Reactions Bulletin
- ◆ The Schedule of Pharmaceutical Benefits
- ◆ Australian Medicines Handbook
- ◆ The Adverse Drug Reactions Unit of the TGA
- ◆ ADRAC website, <http://www.health.gov.au/tga/docs/html/adr.htm>

The knowledge of doctors and hospital pharmacists regarding where they can find the 'blue card' are summarised in Table 3.23.

Table 3.23 *Doctors' and hospital pharmacists' knowledge in where the ADRAC 'blue card' can be found. Respondents may answer more than one source.*

Source	Doctor		Pharmacist	
	n=185	% of cases	n=461	% of cases
MIMS**	24	16.1	23	5.1
AMH*	9	6.0	77	17.0
Schedule of Pharmaceutical Benefits*	81	54.4	384	85.0
Adverse Drug Reaction Bulletin*	88	59.1	365	80.0
ADRAC website**	50	33.6	172	38.1
Total responses	252	169.1	1021	225.9

* χ^2 , $p < 0.001$, between doctors and hospital pharmacist response

** χ^2 , $p > 0.05$, between doctors and hospital pharmacist responses

Compared to doctors, a high proportion of hospital pharmacists knew that the 'blue card' is available in the Schedule of Pharmaceutical Benefits and the Adverse Drug Reaction Bulletin. A lower proportion of doctors and hospital pharmacists knew that it is available through the web and very few knew that it is available in the AMH. Indeed, based on comments made by several doctor respondents, some did not know what the AMH was. More promotion to inform health professionals regarding the availability of the 'blue card' is an important conclusion from these data.

3.2.7. Compensation for ADR Reporting

Hospital pharmacists and doctor opinions whether compensation should be available for reporting ADR is shown in Table 3.24.

Table 3.24 Compensation given for reporting ADRs in the hospital

	Doctors n=185 % Yes	Pharmacists n=461 % Yes	χ^2 ^a
Reward/fee given in the present ADR system in the hospital	0	15	p < 0.001
Should a reward/fee be given for reporting ADRs in the hospital?	17	27	p = 0.021
Acknowledgement given in the present ADR system in the hospital	7	27	p < 0.001
Should an acknowledgement be given for reporting ADRs in the hospital	58	68	p = 0.026

^a χ^2 between doctor and hospital pharmacist responses

Results show that both doctors and hospital pharmacists thought that a reward/fee is not necessary to be given, consistent with the response from chief pharmacists (Table 3.11). This suggests that not providing a reward/fee would not impact on reporting rate, however results from the hospital pharmacy survey of the present study shows there was an association between rewards given and reporting rate (section 3.1.15).

Both respondent categories (68% hospital pharmacist and 58% doctor) indicated that acknowledgement should be given. It is not clear why respondents prefer to be given acknowledgement than reward since there was no question to clarify this

aspect in the questionnaire. However, acknowledgement for reporting ADRs reflects appreciation to the reporter and would probably encourage reporting. In section 3.1.15, feedback and rewards have been shown to have an association with the reporting rate. In contrast, chief pharmacists, doctors and hospital pharmacists agreed that reward is not important for with ADRs reporting. Feedback has not been included in the questionnaire for doctors and hospital pharmacists, therefore it is not possible to compare the results with the previous section. However, as has been discussed before, feedback could be categorised as part of education, especially general feedback for all staff. Previous studies included acknowledgement as part of the interventions to improve ADRs reporting rate.^{34,35} In addition to education and promotion of ADR reporting, reward and feedback clearly have a role in improving reporting rates, although the most suitable reward and the most effective forms of feedback have not been clearly established.

3.2.8. Factors that would Encourage ADR Reporting

Factors that may encourage hospital pharmacists and doctors to report ADRs are presented in Table 3.25. All factors included in the questionnaire obtained more than 85% positive responses from respondents.

Table 3.25 Factors that would encourage respondents to report ADRs within the hospital and to ADRAC

Factor	Pharmacists n=461 % Agree	Doctors n=185 % Agree	χ^2^a
Seriousness of the reaction	99	98	NS
Unusual reaction	99	94	p<0.001
Reaction to a new product	99	97	NS
Confidence in the diagnosis of the ADR	85	87	NS

^a χ^2 between doctor and hospital pharmacist responses, NS = not significant (p>0.05)

Serious reactions and unusual reactions would encourage respondents to report an ADR associated with a drug. It is important to know the criteria of 'serious' and 'unusual reactions' as in the clinical setting it may be difficult to decide if the reaction should be reported.

Other factors that may encourage respondents to report ADRs quoted by doctors were drug interaction; rarely used drugs; ease of reporting; and constant reminder. Other factors that may encourage reporting ADR stated by hospital pharmacist respondents were possible drug interaction; cause of hospitalisation; reaction which meet ADRAC guidelines; time allocation to the task; encouragement from medical staff and pharmacy managers; pertaining to a particular group; increasing frequency; ease of reporting; regular reminder; preventable reaction; and the awareness of the importance of reporting.

Time allocation given for ADRs-associated activities, encouragement, ease of reporting, and regular reminders, are achievable factors that could encourage reporting. Further investigation is needed to clarify whether these factors are important. Sweis and Wong⁴¹ found that active support for ADRs reporting would encourage hospital pharmacists to report ADRs.

3.2.9. Factors that would Discourage ADRs Reporting

Factors that may discourage doctors and hospital pharmacists from reporting ADRs are presented in Table 3.26.

Table 3.26 Factors that would discourage respondents to report ADRs within the hospital and to ADRAC

Factor	Doctors n=185 % Agree	Pharmacists n=185 % Agree	χ^2
Uncertain association	86	61	p<0.001
Too trivial to report	90	74	p<0.001
Too well known to report	91	70	p<0.001
Not enough time to fill in a report	41	44	NS
Report form not readily available	59	18	p<0.001
Unsure how to report	25	10	p<0.001
The system is too bureaucratic	34	9	p<0.001
Concern that a report will require extra work	37	27	p=0.02
Concern about patient confidentiality	4	4	NS
Concern about legal liability	12	6	p=0.02
Lack of confidence in discussing with doctor	N/A	7	N/A
Level of drug knowledge not adequate	28	11	p<0.001
Want to publish report in biomedical literature	7	3	NS

χ^2 between doctor and hospital pharmacist responses, NS = not significant ($p>0.05$), N/A = not applicable.

Even though ADRAC encourages reporting of all ADRs, Table 3.26 shows that minor reactions and well known reactions would discourage doctors and hospital pharmacists from reporting the ADR. Time constraint was an important factor that would discourage respondents from reporting (41% and 44% for doctors and hospital pharmacists respectively) in accordance with 51% of hospital pharmacists in a previous study in the UK.⁴¹ Time allocated for ADR reporting in daily or weekly routine tasks would encourage reporting. The availability of the ADR form was a concern of 59% of doctors but only 18% of hospital pharmacists. As described in section 3.2.6, availability of ADR forms is actually much better than many respondents realise.

Other factors that may discourage from reporting ADRs quoted by some doctor respondents were lack of awareness, forget to report, no incentive, poor feedback, and routine hospital policy not available. Other factors that may discourage reporting of ADRs that were quoted by hospital pharmacist respondents included difficulty in establishing starting date, lack of adequate information, lack of medical knowledge, form is inflexible, and ADR report is of low priority.

As stated by some doctors, forgetting to report the suspected ADRs might be one of the important factors that deter the reporting. Regular reminders of ADR reporting in the form of flyers, presentation during clinical meeting and regular article in the local periodicals might increase reporting. Ease of reporting could also improve ADR reporting.

Some factors that did not discourage from reporting including concern about patient confidentiality, concern about legal liability, lack of confidence in discussing with doctor (only for hospital pharmacist respondents) and publishing report in biomedical literature. It reflected that respondents understand that information regarding identities of reporters, patients and institutions provided through the 'blue card' is confidential.

3.2.10. ADR Hypothetical Questions

The hypothetical questions included were actual ADRs to the drug and had been selected to represent ADRs associated with new and old drugs, well known and rare reactions, and serious and minor reactions. Serious reactions were considered to be ADRs with dire consequences, such as death, hospitalisation or disability. Minor reactions were considered to be symptoms that caused discomfort. The doctors and pharmacists decision to report the ADR hypothetical questions are presented in Table 3.27. Pharmacists who were not working in the hospital setting were also welcomed to participate in this section. One hypothetical question, 'Rhabdomyolysis with cerivastatin', was excluded from the analysis following the withdrawal of the drug from the Australian market, which occurred during the course of this study.

Table 3.27 Responses from respondents for the ADR hypothetical questions. Respondents had been asked to indicate which reactions they would report.

Reaction ^a	ADRAC ^b	CSM ^c	Doctors n=185 (%)	Pharmacist n=461 (%)
a. Jaundice – frusemide	Yes	Yes	80 Y	90 Y
b. Agranulocytosis – spironolactone	Yes	-	91 Y	99 Y
c. Thrombocytopenia – enoxaparin	Yes	-	75 Y	88 Y
d. Thrombocytopenia – heparin	Yes	Yes	40 Y	57 Y
e. Duodenal ulcer – celecoxib	Yes	-	64 Y	97 Y
f. Duodenal ulcer – diclofenac	Yes	-	17 Y	40 Y
g. Toxic epidermal necrolysis – tramadol	Yes	-	98 Y	99 Y
h. Constipation – tramadol	Yes	-	5 Y	18 Y
i. Neutropenia – ACE Inhibitor	Yes	-	30 Y	70 Y
j. DVT – oral contraceptive	Yes	-	28 Y	63 Y
k. Headache – venlafaxine	No	Yes	93 N	78 N
l. Weight loss – venlafaxine	No	-	86 N	60 N
m. Nausea – montelukast	No	Yes	89 N	72 N
n. Cold extremities - β blockers	No	No	95 N	76 N

^a The reactions are an actual ADR to each drug

^b Response are from ADRAC secretariat

^c CSM : Committee on Safety of Medicine (UK)⁸

Y were answer for yes, N were answer for no.

Staff of the ADRAC secretariat provided the preferred responses for the hypothetical ADR questions. The responses given by the ADRAC secretariat were in accordance with the list of ADRs expected to be reported, as listed in the back cover of the Adverse Drug Reactions Bulletin. The doctors and pharmacists decision to report the ADR hypothetical questions compared to the response from ADRAC secretary is seen in Table 3.27.

CSM responses for certain reactions, obtained from a previous study in UK⁸, were compared to responses from ADRAC. There were two ADRAC responses that were different to the CSM responses as presented in Table 3.27. The differences were possibly due to the time differences, as the UK study had been done approximately 2 years earlier and at the time of the survey was done, venlafaxine and montelukast were still categorised as new drugs in the UK.

Statistical analysis (χ^2 test) to find association between doctor and pharmacist response resulted in $p < 0.001$ except for toxic epidermal necrolysis (TEN) with tramadol ($p > 0.05$). However, in regards to clinical practice, there was probably little difference between doctors and pharmacist responses in some of the ADRs, for example jaundice with frusemide (question a).

Reactions to new drugs were represented by duodenal ulcer with celecoxib (e) and TEN (g) and constipation associated with tramadol (h). TEN and duodenal ulcer could be considered serious reactions, and constipation could be categorised as a minor reaction. Results in Table 3.27 show that more serious reactions were more likely to be reported than a minor reaction even though the reactions were associated with new drugs. In the clinical setting, constipation associated with tramadol would probably be difficult to confirm due to uncertain association with the drug. Unlike serious reactions, it is more difficult to establish a relationship between a minor reaction and the responsible drug. Therefore, minor ADRs were less likely to be reported.

Reactions associated with older drugs were categorised by serious and minor reaction, also well known and rare reaction. Thrombocytopenia associated with heparin (d), and neutropenia with ACE inhibitor (i) are serious reactions associated with old drugs. Headache with venlafaxine (k), weight loss with venlafaxine (l) and nausea with montelukast (m), are minor reactions associated with established drugs. A higher proportion of respondents were more likely to report serious reactions than minor reactions, however the reporting rates for the serious reactions were not as high as the reporting rate obtained with the new drugs.

Jaundice with frusemide (a), and agranulocytosis with spironolactone (b) are rare reactions associated with old drugs. DVT with oral contraceptive (j) and cold extremities with β blockers (n) are well known reactions associated with old drugs. Results show that a higher proportion of respondents would report rare reactions than well known reactions.

Comparison between reactions associated with old drugs and new drugs as represented by thrombocytopenia with heparin (d) and enoxaparin (c), and duodenal ulcer with diclofenac (f) and celecoxib (e) shows that respondents were more likely to report reactions associated with newer drugs in the case of serious reactions. However, as had been shown before, minor reactions associated with new drugs would still be underreported. Other studies showed that respondents were more likely to report serious reactions to new drugs and rare reaction associated with a drug.^{8,43} The present study found a similar trend.

Table 3.28 *Number of hypothetical ADRs the respondents would like to report*

	Mean	SD	95% CI
<i>Out of 14 hypothetical ADRs:</i>			
Doctor (n=245)	5.5	2.7	5.2-5.9
Pharmacist (n=504)	8.4	2.6	8.2-8.7
<i>Out of 10 hypothetical ADRs that ADRAC would favour reporting:</i>			
Doctor	5.2	2.4	4.9-5.5
Pharmacist	6.6	1.9	6.4-6.7
<i>Out of 4 hypothetical ADRs that ADRAC would not favour reporting:</i>			
Doctor	0.31	0.7	0.2-0.4
Pharmacist	1.1	1.2	1.0-1.2

*There was significance different ($p < 0.001$) between all doctors and pharmacist response using independent groups t-test (2 sample t-test)
95% CI= 95% confidence interval*

Table 3.28 summarises the mean number of ADR reports. In a previous study from the UK, from five hypothetical ADR reactions that were expected to be reported by CSM, the mean number of reports by pharmacists were 3.7 ± 1.7 .⁸ In the present

study, from the ten hypothetical ADRs that ADRAC indicated should be reported, there was significant under-reporting by doctors (5.2 ± 2.4) and pharmacists (6.6 ± 1.9), as demonstrated by the upper band of the 95% confidence interval being less than 10 (Table 3.28). Although the actual ADR reporting rate might be lower in the real clinical setting (compared to these results), it is reasonable to assume that the reporting rate may reflect the real response if there is certainty of the ADR (particularly a serious reaction or if it is associated with new drugs). When there is uncertainty of the ADRs, the real reporting rate could be considerably lower.

In the present study, even though pharmacists would likely report a higher number of ADR reports compared to doctors, it is still considered to be under-reporting. To obtain a higher reporting rate and higher quality of reports as expected by ADRAC, improving pharmacist participation and knowledge would be beneficial. ADR reporting systems which are designed to provide easy reporting for doctors, for instance the notification system (section 1.5.2) utilising a card or telephone hotline, could be important.

3.3. Retrospective Audit of Penicillin Allergy

There were 138 patient records coded as "penicillin causing adverse effect" retrieved by the medical record staff in FHHS. From those records, 85 were medical records of patients with documented penicillin allergy during admission or causing admission to FHHS that were included in the analysis (Table 3.29). There was one record that was not available, 35 records of patients with documented ADRs (other than allergy) to penicillin and 17 records that were excluded because of lack of confirmation of penicillin allergy documented in the medical records. Patients with documented allergic reaction to penicillin in the hospital were chosen instead of patients with a history of penicillin allergy, because self-reported history of penicillin allergy has been shown to have a low accuracy for the diagnosis of true penicillin allergy.⁴⁶ Patients' demographic data, history of previous allergy with penicillin, allergic symptoms, onset of allergy and treatment of allergy are presented in Table 3.30.

Table 3.29 *Demographic data of patients experiencing penicillin allergy during admission or causing admission in Fremantle Hospital and Health Services (FHHS) between 1994-January 2001*

	Number (%), n=85
Mean Age, {years (range)}	48 (3 months old – 91)
Gender	
Female	40 (47)
Male	45 (53)

Appropriate documentation of the incidence of penicillin allergy is important to prevent the patients being rechallenged. In FHHS, any ADRs including drug allergy must be documented on the front cover and inside cover of the medical record, on the medication chart and in the medical notes. Drug alert stickers should be attached to the front cover of medical records and the front of the medication chart. These alerts are important to immediately remind health professionals of any ADRs experienced by the patient.

Table 3.30 Patients experiencing penicillin allergy during admission or causing admission in Fremantle Hospital and Health Services (FHHS) between 1994-January 2001

	Number (%), n=85
Previous history of allergy to penicillin	4 (5)
Principal Symptom of allergy	
Anaphylaxis	17 (20)
Rash	57 (67)
Other	11 (13)
Onset of allergy	
≤ than 1 hours	28 (33)
1 to 72 hours	39 (45)
> 72 hours	15 (18)
Unknown	3 (4)
Penicillin causing allergy*	
Benzyl penicillin	16 (19)
Phenoxymethyl penicillin	5 (6)
Flucloxacillin	34 (40)
Amoxicillin	23 (27)
Augmentin® (Amoxicillin and potassium clavulanate)	13 (15)
Timentin® (Ticarcillin and potassium clavulanate)	1 (1)
Ampicillin	2 (2)
<i>Total</i>	<i>93 (110)</i>
Route of admission of penicillin causing allergy*	
Oral	46 (55)
IV	47 (56)
<i>Total</i>	<i>93 (111)</i>
Treatment of allergy*	
Antihistamine (promethazine)	53 (84)
Corticosteroid	
Prednisolone	5 (8)
Hydrocortisone	26 (41)
Adrenaline	16 (25)
Salbutamol nebuliser	5 (8)
0.9% Sodium Chloride	3 (5)
Other (calamine lotion, betamethasone dipropionate cream)	7 (11)
<i>Total</i>	<i>115 (182)</i>

* Patients may have more than one treatment

The present study found that from 85 patients' medical records, drug alert stickers were attached in 28% (n=24) to the front cover of medical records and 89% (n=69) to the front of the medication chart. Brief information regarding the allergic reactions (date, reactions involved, drug name) were found in 31% (n=26) of medical records' inside cover. In a previous 5-month survey of ADRs at FHHS in 1997, it was found that 93% of ADRs were documented in the medical record, 36% in the medication chart and 36% on the inside of the medical records.¹⁹

These results suggest that the documentation of allergic reactions in FHHS could be improved. In particular, assessment of the reason(s) for the low rate of documentation of allergic reactions on the front and inside cover of the medical records is required. It is possible that health professionals are more likely to read the front part of the medication chart than the front and inside cover of medical records to find any relevant history of allergy. However, as the principal source of information, the medical record should have complete documentation of allergic reactions.

It was also shown that from the 85 patients with a documented allergic reaction to penicillin, only two (2.4%) were reported to ADRAC. The symptoms of the allergic reactions reported to ADRAC were rash.

3.3.1. Incidence of Cross-sensitivity between Penicillin and Other β -lactam Antibiotics

Patients allergic to penicillin were further classified to find the incidence of allergy to other β -lactam antibiotics (Table 3.31). Six patients were classified as possibly allergic to a cephalosporin, due to a lack of definitive documentation in the medical record. The overall incidence of confirmed cephalosporin allergy in the present study was consistent with the incidence of cross-sensitivity between penicillin and cephalosporin which, according to the Therapeutic Guidelines, is 3 to 6%.⁴⁸ None of the 85 patients had documentation of skin test to penicillins or cephalosporins being administered. It was difficult to further determine the relationship between the

antibiotics and the symptoms; therefore the overall incidence of cross-sensitivity between penicillin and cephalosporin in the present study may be overestimated (i.e. definite and possible).

Table 3.31 Incidence of reported allergy to other β -lactam antibiotics, in patients allergic to penicillin during admission or causing admission in Fremantle Hospital and Health Services (FHHS) between 1994-January 2001. Possible allergy was classified as lack of definitive documentation in patients' medical records.

Reported allergy	No (%)
Cephalosporins ^a	Possible 6 (13) Definite 3 (6)
Carbapenems ^b	None
Monobactams ^c	None

^a There were 47 patients given cephalosporins

^b Only one patient was given imipenem

^c None of the patients received monobactams as a therapy

The incidence of cross-sensitivity between penicillin and carbapenems and monobactams was unable to be identified because only one patient was given carbapenem (imipenem) and none was given a monobactam during the admission in FHHS.

There is a concern regarding the use of broad-spectrum antibiotics given to patients allergic to penicillin. The emergence of multiple-drug resistant bacteria due to unnecessary use of the broad-spectrum antibiotics (for example vancomycin-resistant enterococci and vancomycin-resistant *Staphylococcus aureus*) is becoming a problem because they are resistant to most clinically available antibiotics.⁷⁸ The antibiotics prescribed in lieu of penicillin for the patients in this study are listed in Table 3.32. The antibiotics mostly used to replace penicillin were cephalosporins (34%) followed by clindamycin (19%) and ciprofloxacin (12%). A previous study in the USA found that vancomycin (38.5%) and clindamycin (31.9%) were the antibiotics frequently prescribed to patients allergic to penicillin.⁴⁷ The reason for the low use of vancomycin in FHHS compared to the higher use in the US is not clear.

However, the use of vancomycin at FHHS is restricted and this may have contributed to the low use of vancomycin.

Interestingly, there were six (10%) patients given a penicillin to replace the penicillin causing allergic reaction. The allergic symptoms of penicillin allergy in those patients were of mild reactions. One patient was allergic to phenoxymethyl penicillin and replaced with timentin and experienced further allergic reaction to timentin. The five patients who did not experience allergic reactions were probably allergic to a specific penicillin.

Table 3.32 Antibiotic therapy prescribed in place of penicillin for patients with documented penicillin allergy in Fremantle Hospital and Health Services (FHHS) between 1994-January 2001

Antibiotics therapy	No (%)
Penicillins	6 (10)
Phenoxymethyl penicillin	
Flucloxacillin	
Amoxicillin	
Augmentin® (Amoxicillin and potassium clavulanate)	
Timentin® (Ticarcillin and potassium clavulanate)	
Cephalosporins	20 (34)
Cephalexin	
Cephalothin	
Cephazolin	
Cephmandole	
Aminoglycoside	2 (3)
Gentamicin	
Tetracycline	1 (2)
Doxycycline	
Macrolide	6 (10)
Erythromycin	
Roxythromycin	
Lincosamide	11 (19)
Clindamycin	
Glycopeptides	3 (5)
Vancomycin	
Nitroimidazole	3 (5)
Metronidazole	
Quinolone	7 (12)
Ciprofloxacin	

CHAPTER 4 CONCLUSIONS

This study comprised a comprehensive range of surveys on ADRs in Australia, including every hospital pharmacy department (with 49.5% response rate) and more than half of the hospital pharmacists, with a response rate representing approximately 25% of all hospital pharmacists.

The ADR reporting systems used in Australian hospitals were variable. The systems included a centralised system (mostly in the pharmacy department), the use of the ADRAC 'blue card', the active screening of ADRs through laboratory tests and triggers, and the active seeking of ADRs. As part of the ADR systems, most hospitals targeted all drugs for ADR reporting. However, there was no association between higher reporting rates and the existence of a centralised ADR reporting system or the existence of an ADR policy in the hospital. Feedback and rewards given for reporting ADRs have been shown to have an association with higher reporting rate, even though the chief pharmacists, doctors and hospital pharmacists in the present studies claimed that rewards are not necessary. Reporting rate of ADRs to ADRAC in 2000 ranged between zero and 1.09% (median=0.02%) which overall is considered to be low. To improve the reporting rate in Australian hospitals, multiple factors need to be considered including the implementation of rewards, feedback and a centralised ADR system. Education and regular promotion of ADR reporting might contribute to the reporting rate.

Hospital pharmacists had a better understanding of the ADR reporting within the hospital and the ADR reporting to ADRAC compared to the WA doctors. Factors that would encourage reporting ADRs were similar to previous reports including seriousness of the ADR, unusual ADR, ADR to a new drug, and confidence in the diagnosis of the ADR. Reasons for not reporting ADRs included, when there is uncertain association between the suspected drug and the ADR, the ADR is a minor

reaction and when the ADR is well known. From the 14 hypothetical ADRs, WA doctors and hospital pharmacists were more likely to report serious ADRs, ADRs associated with new drugs and rare ADRs. Overall hospital pharmacists were more likely to report ADRs than doctors.

The incidence of cross-sensitivity between penicillin and cephalosporins in FHHS was 6%, which is consistent with standard references. The existence of drug alert stickers in the front cover and inside cover of medical records regarding the allergic reaction to penicillin experienced by the patients were considered low; therefore the documentation of allergic reactions in FHHS could be improved.

Recommendations for future studies of ADRs include:

1. Determination of strategies to improve and sustain the ADR reporting system in Australian hospitals.
2. Prospective research to implement and evaluate factors that may improve reporting rate in the hospital setting (i.e. feedback and rewards for reporting ADRs).
3. Assessment of the role of education and regular promotion on ADR reporting.
4. A community based study to assess factors that would improve ADR reporting by community pharmacists and general practitioners.

REFERENCES

1. Stephens MDB, Talbot JCC, Routledge PA, editors. *Detection of New Adverse Drug Reactions*. 4th ed. UK: MacMillan References; 1998.
2. Rawlins MD, Thomas SHL. Mechanisms of adverse drug reactions. In: Davies DM, Ferner RE, de Glanville H, editors. *Davies's Textbook of Adverse Drug Reactions*. London: Chapman & Hall Medical; 1998. p. 40-64.
3. Newby D. An introduction to ADRs. *Current Therapeutics* 1995;36(9):95-7.
4. Lazarou J, Pomeranz BH, Corey PN. Incidence of adverse drug reactions in hospitalized patients: A meta-analysis of prospective studies. *JAMA* 1998;279:1200-5.
5. Lee A, Rawlins MD. Adverse drug reaction. In: Walker R, Edwards C, editors. *Clinical Pharmacy and Therapeutics*. 2nd ed. Edinburgh: Churchill Livingstone; 1999. p. 33-45.
6. Cunningham G, Krska J. Adverse drug reactions. In: Winfield AJ, editor. *Pharmaceutical Practice*. 2nd ed. Edinburgh: Churchill Livingstone; 1998. p. 355-65.
7. Stergachis A, Hazlet TK. Pharmacoepidemiology. In: Dipiro JT, Talbert RL, Yee GC, Matzke GR, Wells BG, Posey LM, editors. *Pharmacotherapy: A Pathophysiologic Approach*. 4th ed. Stamford, Connecticut: Appleton and Lange; 1999. p. 62-9.
8. Green CF, Mottram DR, Rowe PH, Pirmohamed M. Attitudes and knowledge of hospital pharmacists to adverse drug reaction reporting. *Br J Clin Pharmacol* 2001;51:81-6.
9. Pirmohamed M, Breckenridge AM, Kitteringham NR, Park BK. Adverse drug reactions. *BMJ* 1998;316:1295-8.
10. Lawson DH. Epidemiology. In: Davies DM, Ferner RE, de Glanville H, editors. *Davies's Textbook of Adverse Drug Reactions*. 5th ed. London: Chapman and Hall Medical; 1998.
11. Bates DW. Drugs and adverse drug reactions: How worried should we be? *JAMA* 1998;279:1216-7.
12. Roughead EE. The nature and extent of drug-related hospitalisations in Australia. *J Qual Clin Pract* 1999;19:19-22.
13. Wilson RM, Runciman WB, Gibberd RW, Harrison BT, Newby L, Hamilton JD. The quality in Australian health care study. *Med J Aust* 1995;163:458-71.

14. Roughead EE, Gilbert AL, Primrose JG, Sansom LN. Drug-related hospital admissions: a review of Australian studies published 1988-1996. *Med J Aust* 1998;168:405-8.
15. Dartnell JGA, Anderson RP, Chohan V, Galbraith KJ, Lyon MEH, Nestor PJ, et al. Hospitalisation for adverse events related to drug therapy: incidence, avoidability and costs. *Med J Aust* 1996;164:659-62.
16. Belton KJ, Lewis SC, Payne S, Rawlins MD. Attitudinal survey of adverse drug reaction reporting by medical practitioners in the United Kingdom. *Br J Clin Pharmacol* 1995;39:223-6.
17. Elkerton JR. The documentation of adverse drug reactions. *Aust J Hosp Pharm* 1995;25:502-7.
18. Rohan A. Adverse drug reactions - They are all important. *Aust J Hosp Pharm* 1992;22:166-7.
19. Simons C, Georgeson L, Hill R. Adverse drug reactions: Can we reduce the risk? Fremantle Hospital and Health Service Drug Bulletin 1997;22:15-9.
20. Pillans PI, Mathew TH, Coulter DM. Pharmacovigilance in Australia and New Zealand: towards 2000. *Med J Aust* 1999;170:245-6.
21. ADRAC. Drug safety It's on the cards. *Australian Adverse Drug Reactions Bulletin* 1994;13:15.
22. Brown SD, Landry FJ. Recognizing, reporting, and reducing adverse drug reactions. *South Med J* 2001;94:370-3.
23. Ajayi FO, Sun H, Perry J. Adverse drug reactions: A review of relevant factors. *J Clin Pharmacol* 2000;40:1093-1101.
24. Edwards IR, Aronson JK. Adverse drug reactions: Definition, diagnosis, and management. *Lancet* 2000;356:1255-9.
25. Waller PC, Wood SM. Regulatory aspects of adverse drug reactions. In: Davies DM, Ferner RE, de Glanville H, editors. *Davies's Textbook of Adverse Drug Reactions*. 5th ed. London: Chapman & Hall Medical; 1998.
26. Roeser HP, Rohan AP. Post-marketing surveillance of drugs. The spontaneous reporting scheme: role of the Adverse Drug Reactions Advisory Committee. *Med J Aust* 1990;153:720-6.
27. ADRAC. Your reports at work - drug safety in Australia. *Australian Adverse Drug Reaction Bulletin* 2001;21:15-6.
28. *Australian Medicines Handbook*. Adelaide: Australian Medicines Handbook Pty Ltd; 2000.
29. Low J. Adverse drug reactions - a broad perspective. *Aust J Hosp Pharm* 1993;74:603.

30. The Society of Hospital Pharmacists of Australia Committee of Specialty Practice in Clinical Pharmacy. SHPA Standards of Practice for Clinical Pharmacy. SHPA Practice Standards 1996:2.5-2.6.
31. Yap K. Adverse drug reactions monitoring systems used by Australian hospitals. *Aust J Hosp Pharm* 1982;12:2-7.
32. Swan GT, Jones AN, Hughes JD, Plumridge RJ. Adverse drug reactions: A systematic approach to documentation and reporting in hospital. *Aust J Hosp Pharm* 1983;13:137-41.
33. Raymond PM, Robertson MB. Adverse drug reaction reporting in Melbourne teaching hospitals. *Aust J Hosp Pharm* 1994;24:237-42.
34. Scott HD, Thacher-Renshaw A, Rosenbaum SE, Waters Jr WJ, Green M, Andrews LG, et al. Physician reporting of adverse drug reactions: results of the Rhode Island adverse drug reaction reporting project. *JAMA* 1990;263:1785-8.
35. Colodny L, Spillane J. Toward increased reporting of adverse drug reactions. *Hosp Pharm* 1999;34:1179-85.
36. Etzel JV, Brocavich JM, Rousseau M. Impact of the development of a multidisciplinary adverse drug reaction committee. *Hosp Pharm* 1995;30:1083-7.
37. Ferguson M, Dhillon S. A survey of adverse drug reaction reporting by hospital pharmacists to the Committee on Safety of Medicines-the role of pharmacy departments. *Int J Pharm Pract* 1999;7:167-71.
38. Green CF, Mottram DR, Rowe PH, Brown AM. Adverse drug reaction monitoring by United Kingdom hospital pharmacy departments: Impact of the introduction of "yellow card" reporting for pharmacists. *Int J Pharm Pract* 1999;7:238-46.
39. British National Formulary, editor. *British National Formulary*. 39 ed. London: British Medical Association: Pharmaceutical Society of Great Britain; 2000.
40. Edwards IR. Pharmacological basis of adverse drug reactions. In: Speight TM, Holford NHG, editors. *Avery's Drug Treatment*. 4th ed. Auckland: Adis International; 1997. p. 261-99.
41. Sweis D, Wong ICK. A survey on factors that could affect adverse drug reaction reporting according to hospital pharmacists in Great Britain. *Drug Saf* 2000;23:165-72.
42. Bäckström M, Mjörndal T, Dahlqvist R, Nordkvist-Olsson T. Attitudes to reporting adverse drug reactions in northern Sweden. *Eur J Clin Pharmacol* 2000;56:729-32.
43. Eland IA, Belton KJ, Van Grootheest AC, Meiners AP, Rawlins MD, Stricker BHC. Attitudinal survey of voluntary reporting of adverse drug reactions. *Br J Clin Pharmacol* 1999;48:623-7.
44. Belton KJ, The European Pharmacovigilance Research Groups. Attitude survey of adverse drug-reaction reporting by health care professionals across the European Union. *Eur J Clin Pharmacol* 1997;52:423-7.
45. Adelman D. Penicillin allergy. *West J Med* 1991;154:456.

46. Salkind AR, Cuddy PC, Foxworth JW. Is this patient allergic to penicillin? An evidence-based analysis of the likelihood of penicillin allergy. *JAMA* 2001;285:2498-2505.
47. Lee CE, Zembower TR, Postelnick MJ, Greenberger PA, Peterson LR, Noskin GA. The incidence of antimicrobial allergies in hospitalized patients. *Arch Intern Med* 2000;160:2819-22.
48. Writing Group for Therapeutic Guidelines: Antibiotic. *Therapeutic guidelines: antibiotic*. 10th ed. Melbourne: Therapeutic Guidelines Limited; 2000.
49. Gallelli JF, Calis KA. Penicillin allergy and cephalosporin cross-reactivity. *Hosp Pharm* 1992;27:540-1.
50. Arroliga ME, Wagner W, Bobek MB, Hoffman-Hogg L, Gordon SM, Arroliga AC. A pilot study of penicillin skin testing in patients with a history of penicillin allergy admitted to a medical ICU. *Chest* 2000;118:1106-8.
51. Wyer SL. Documentation of penicillin allergy in veterans' hospital. *Aust J Hosp Pharm* 1997;27:296-301.
52. Palatine. Penicillin allergy: high prevalence of a vague history in skin test-positive patients. *Ann Allergy Asthma Immunol* 2000;85:180.
53. Assem E-SK. Drug allergy and tests for its detection. In: Davies DM, Ferner RE, de Glanville H, editors. *Davies's Textbook of Adverse Drug Reactions*. London: Chapman & Hall Medical; 1998.
54. DiPiro JT, Stafford CT, Schlesselman LS. Allergic and pseudoallergic drug reactions. In: DiPiro JT, Talbert RL, Yee GC, Matzke GR, Wells BG, Posey LM, editors. *Pharmacotherapy: A Pathophysiologic Approach*. 4th ed. Connecticut: Appleton and Lange; 1999. p. 1393-405.
55. Benowitz NL, Pentel P, Leatherman J. Drug use in the critically ill. In: Speight TM, Holford NHG, editors. *Avery's Drug Treatment*. 4th ed. Auckland: Adis International Ltd; 1997. p. 515-49.
56. Fisher MM. Anaphylaxis. In: Oh TE, editor. *Intensive Care Manual*. 4th ed. Oxford: Butterworth Heinemann; 1998. p. 509-11.
57. Patriarca G, D'Ambrosio C, Schiavino D, Larocca LM, Nucera E, Milani A. Clinical usefulness of patch and challenge test in the diagnosis of cell-mediated allergy to betalactams. *Ann Allergy Asthma Immunol* 1999;83:257-66.
58. McConnell SA, Penzak SR, Warmack TS, Anaissie EJ, Gubbins PO. Incidence of imipenem hypersensitivity reactions in febrile neutropenic bone marrow transplant patients with a history of penicillin allergy. *Clin Infect Dis* 2000;31(15):12-4.
59. Saxon A, Adelman DC, Patel A, Hadju R, Calandra GB. Imipenem cross-reactivity with penicillin in humans. *J Allergy Clin Immunol* 1988;82:213-7.
60. Polgar S, Thomas SA. *Introduction to Research in the Health Sciences*. 3rd ed. Melbourne: Churchill Livingstone; 1995.

61. Portney LG, Watkins MP. *Foundations of Clinical Research: Applications to Practice*. 2nd ed. New Jersey: Prentice Hall Health; 2000.
62. Hastie B, McNeil V, Concannon J. *Adverse drug reaction documentation questionnaire*. Perth: Fremantle Hospital and Health Services; 1990.
63. Barber N, Wilson A. Adverse reactions to drugs. In: Barber N, Wilson A, editors. *Clinical Pharmacy Survival Guide*. London: Churchill Livingstone; 1999. p. 127-280.
64. Dawson-Saunders B, Trapp RG. *Basic and Clinical Biostatistics*. 2nd ed. Norwalk, Connecticut: Apleton & Lange; 1994.
65. Ott RL. *An Introduction to Statistical Methods and Data Analysis*. 4th ed. California: Duxbury Press; 1994.
66. McLennan DN, Doley MJ. National survey of clinical activity documentation practices. *Aust J Hosp Pharm* 2000;30:6-9.
67. The Society of Hospital Pharmacists of Australia Committee of Specialty Practice in Home Health Care. A survey of parenteral therapy services provided to home patients by Australian hospital pharmacies. *Aust J Hosp Pharm* 1997;27:373-80.
68. Fellows L, Hughes JD. A survey of drug audit practices and promotion of quality prescribing in Australian hospitals with a focus on psychotropic drugs. *Aust J Hosp Pharm* 2000;30:196-201.
69. McEwen J. Improving adverse drug reaction monitoring. *Current Therapeutics* 1987;38(7):29-38.
70. Trick OI. Adverse drug reactions: Establishing a hierarchy of definitions for adjustment of report rates. *Hosp Pharm* 1996;31:1593-5.
71. Smith CC, Bennett PM, Pearce HM, Harrison PI, Reynolds DJM, Aronson JK, et al. Adverse drug reactions in a hospital general medical unit meriting notification to the Committee on Safety of Medicines. *Br J Clin Pharmacol* 1996;42:423-9.
72. Clark LM, Bellette PK, Robinson M. Communication of adverse drug reaction between the hospital health care team and general practitioners: how effective is it? *Australian Journal of Hospital Pharmacy* 2001;31:134-7.
73. Doust JA, Silagy CA. Applying the results of a systematic review in general practice. *Med J Aust* 2000;172:153-6.
74. Newell S, Sanson-Fisher RW. Australian oncologists' self-reported knowledge and attitudes about non-traditional therapies used by cancer patients. *Med J Aust* 2000;172:110-3.
75. Pirotta MV, Cohen MM, Kotsirilos V, Farish SJ. Complementary therapies: have they become accepted in general practice. *Med J Aust* 2000;172:105-9.
76. The Society of Hospital Pharmacists of Australia. *SHPA 2000 membership survey results: The Society of Hospital Pharmacists of Australia*; 2000.

77. The Society of Hospital Pharmacists of Australia. Performance appraisal indicators for clinical pharmacists: Recommendations following an Australia-wide survey. *Aust J Hosp Pharm* 1993;23:332-42.
78. Solensky R, Earl HS, Gruchalla RS. Clinical approach to penicillin-allergic patients: A survey. *Ann Allergy Asthma Immunol* 2000;84:329-33.

APPENDICES

Appendix 1: ADRAC 'Blue Card'

Note: For copyright reasons Appendix 1 has not been reproduced.

**(Co-ordinator, ADT Program (Bibliographic Services), Curtin University of
Technology, 07/01/2004)**

Appendix 2: Ethics Approval

MINUTE

To	Yunita Nita, c/- Dr Kevin Batty, Pharmacy
From	Max Page, Executive Officer, Human Research Ethics Committee
Subject	Protocol Approval HR 97/2001
Date	5 June 2001
Copy	Graduate Studies Officer, Division of Health Sciences

Office of Research and Development

Human Research Ethics Committee

TELEPHONE 9266 2784

FACSIMILE 9266 3793

EMAIL nlercht@cc.curtin.edu.au

On behalf of the Human Research Ethics Committee I am authorised to inform you that the project "*ADVERSE DRUG REACTION REPORTING IN AUSTRALIAN HOSPITALS*" is granted **provisional approval**, subject to further information/clarification of the points raised below. Please forward your response to the Secretary, HREC, C/- Office of Research & Development as soon as possible.

Please provide a copy of the following documents:

1. Information sheet for pharmacist.
2. Information sheet for medical staff.

The protocol states that directors will be informed that return of the questionnaire implies consent. This statement should be in the information letter also.

Final approval will be subject to a satisfactory response to the items above.

Provisional approval of this project is for a period of twelve months **30/May/2001** to **29/May/2002**.

When the project has finished or if at any time during the twelve months changes/amendments occur, the attached FORM B is to be completed and returned to Ms Tania Lerch, (Secretary, HREC) C/- Office of Research & Development as soon as possible. The approval number for your project is **HR 97/2001**. *Please quote this number in any future correspondence.*

Please find attached your protocol details together with the application form/cover sheet.



pp Maxwell Page
Executive Officer
Human Research Ethics Committee

J:\OR\HREC\REG99\HR 97/2001

Please Note: If information about the authorisation of this project is required, the following standard statement is suggested for inclusion in the information to subjects section of the protocol. *This study has been approved by the Curtin University Human Research Ethics Committee. If needed, verification of approval can be obtained either by writing to the Curtin University Human Research Ethics Committee, c/- Office of Research and Development, Curtin University of Technology, GPO Box U1987, Perth, 6845 or by telephoning 9266 2784.*

MINUTE

Curtin
UNIVERSITY OF TECHNOLOGY

To	Yunita Nita, c/- Dr Kevin Batty, Pharmacy
From	Max Page, Executive Officer, Human Research Ethics Committee
Subject	Protocol Approval HR 97/2001
Date	12 June 2001
Copy	Graduate Studies Officer, Division of Health Sciences

Office of Research and Development

Human Research Ethics Committee

TELEPHONE 9266 2784

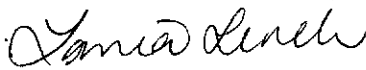
FACSIMILE 9266 3793

EMAIL nlercht@cc.curtin.edu.au

Thank you for providing additional information for the project "ADVERSE DRUG REACTION REPORTING IN AUSTRALIAN HOSPITALS".

The information you have provided has satisfactorily addressed the concerns raised by the Committee, and final approval is granted.

Approval of this project remains for the period of twelve months **30/May/2001** to **29/May/2002**. The approval number for your project is **HR 97/2001**. *Please quote this number in any future correspondence.*



^{2p}
Maxwell Page
Executive Officer
Human Research Ethics Committee

J:\OR\HREC\REG99\HR 97/2001

MINUTE

To	Yunita Nita, c/- Dr Kevin Batty, Pharmacy
From	Max Page, Executive Officer, Human Research Ethics Committee
Subject	Protocol Approval HR 98/2001
Date	25 May 2001
Copy	Graduate Studies Officer, Division of Health Sciences

Office of Research and Development

Human Research Ethics Committee

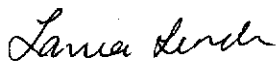
TELEPHONE 9266 2784
FACSIMILE 9266 3793
EMAIL nlercht@cc.curtin.edu.au

On behalf of the Human Research Ethics Committee I am authorised to inform you that the project "RETROSPECTIVE AUDIT IN PATIENTS WITH PENICILLIN ALLERGY AND SUBSEQUENT EXPOSURE WITH BETA-LACTAMS AND/OR CEPHALOSPORIN IN FREMANTLE HOSPITAL" is approved.

Approval of this project is for a period of twelve months **22/May/2001** to **21/May/2002**.

When the project has finished or if at any time during the twelve months changes/amendments occur, the attached FORM B is to be completed and returned to Ms Tania Lerch, (Secretary, HREC) C/- Office of Research & Development as soon as possible. The approval number for your project is **HR 98/2001**. *Please quote this number in any future correspondence.*

Please find attached your protocol details together with the application form/cover sheet.



Maxwell Page
Executive Officer
Human Research Ethics Committee

J:\OR\HREC\REG99\HR 98/2001

Please Note:

If information about the authorisation of this project is required, the following standard statement is suggested for inclusion in the information to subjects section of the protocol.

This study has been approved by the Curtin University Human Research Ethics Committee. If needed, verification of approval can be obtained either by writing to the Curtin University Human Research Ethics Committee, c/- Office of Research and Development, Curtin University of Technology, GPO Box U1987, Perth, 6845 or by telephoning 9266 2784.

Note: For copyright and privacy reasons, this page of Appendix 2 has not been reproduced.

Letter from Fremantle Hospital and Health Service

(Co-ordinator, ADT Program (Bibliographic Services), Curtin University of Technology, 07/01/2004)

Appendix 3: ADRAC Endorsement Letter

Note: For copyright and privacy reasons, Appendix 3 has not been reproduced.

**(Co-ordinator, ADT Program (Bibliographic Services), Curtin University of
Technology, 07/01/2004)**

Appendix 4: Questionnaires

ADR Questionnaire 2001

Ms Yunita, Dr Kevin Batty, Mr Richard Plumridge

Curtin

UNIVERSITY OF TECHNOLOGY
School of Pharmacy
Curtin University of Technology
GPO Box U1987
Perth 6845
WESTERN AUSTRALIA

Section A : Hospital Information

1. Name of Institution _____
2. Type of Hospital
 - 1 Teaching
 - 2 Non Teaching
 - 3 Private
 - 4 Other, *please specify* _____
3. Description Of Hospital
 - 1 Acute Care / General
 - 2 Psychiatric
 - 3 Children
 - 4 Obs/Gynae
 - 5 Other, *please specify* _____
4. Number of beds
 - 1 < 100
 - 2 100-199
 - 3 200-299
 - 4 300-399
 - 5 400-499
 - 6 ≥ 500
5. Total number of patient admissions in 2000 _____
6. Number of Doctors _____
7. Number of Pharmacists
 1. Total _____
 2. Clinical Pharmacists _____

Section B : Adverse Drug Reaction (ADR) Reporting

1. Does your HOSPITAL have a policy regarding Adverse Drug Reaction (ADR) reporting?
 - 1 yes (*please provide a copy of the policy*)
 - 2 no
2. Does your DEPARTMENT have a policy regarding ADR reporting?
 - 1 yes (*please provide a copy of the policy*)
↳ If yes, is the departmental and hospital policy the same ?
 - 3 yes
 - 4 no
 - 2 no
↳ If no, could you provide the reason(s) why there is no departmental policy?

3. How long has the current ADR system been operating?

- 1 less than 1 year 3 6 – 10 years
2 1 – 5 years 4 more than 10 years

4. Which categories of health professionals are encouraged to report ADRs in your hospital (either to the Pharmacy Department or directly to ADRAC)?

- 1 Doctors 3 Nurses
2 Pharmacists 4 Other, *please specify* _____

5. Is the ADR reporting system centralized?

- 1 yes



If yes, who is responsible for collection of reports within the hospital?

- 3 Doctors 5 Nurses
4 Pharmacists 6 Other, *please specify* _____

- 2 no



If no, who is responsible for sending ADR reports (blue forms) to ADRAC?

- 7 Doctors 9 Nurses
8 Pharmacists 10 Other, *please specify* _____

6. Who is responsible for notification of a suspected ADR within the hospital when it first becomes apparent? (Please tick more than one answer if appropriate)

- 1 Doctors 3 Nurses
2 Pharmacists 4 Other, *please specify* _____

7. Are records of ADR reports kept in your hospital?

- 1 yes 2 no



If yes, what sort of records are kept in your HOSPITAL?

- 3 Cards 5 Copy of ADRAC report (blue form)
4 Computer records 6 Other, *please specify* _____

8. Is there someone responsible for collection/screening ADRs within the PHARMACY DEPARTMENT?

- 1 yes 2 no

9. Are copies of ADR reports kept in the PHARMACY DEPARTMENT?

- 1 yes 2 no



If yes, what sorts of records are kept in pharmacy department?

- 3 Cards 5 ADR report (blue form) copy
4 Computer records 6 Other, *please specify* _____

10. Are drug alert stickers used?

- 1 yes
- 2 no

 If yes, on what? (Please tick more than one answer if appropriate)

- 3 Medication chart
- 4 Medical records
- 5 Other, please specify _____

Who is responsible for attaching these?

(Please tick more than one answer if appropriate)

- 6 Doctors
- 7 Pharmacists
- 8 Nurses
- 9 Medical record staff
- 10 Ward clerk
- 11 Other, please specify _____

11. Which drugs are targeted for ADR reporting? (Please tick more than one answer if appropriate)

- 1 All drugs
- 2 New drugs
- 3 ADRAC list of "Drugs of Current Interest"
- 4 Other, please specify _____

12. Does your system use 'triggers' (e.g. Antidote drugs, adrenaline) to identify possible ADRs?

- 1 yes
- 2 no

 If yes, what 'triggers' are used? _____

13. Does your system involve screening laboratory results to detect ADRs?

- 1 yes
- 2 no

 If yes, which laboratory results are used to detect ADRs?

(Please tick more than one answer if appropriate)

- 3 Microbiology
- 4 Drug assays
- 5 Hematology
- 6 Biochemistry
- 7 Other, please specify _____

14. Does ADR reporting lead to any other action, such as the following in your hospital?

(Please tick more than one answer if appropriate)

- 1 Altered prescribing habit
- 2 Formulary alteration
- 3 Information sheets/drug bulletins
- 4 Cost savings
- 5 Regular reporting to Drug & Therapeutics committees
- 6 Other, please specify _____

15. Does your system include any methods of assessing the prevention of ADRs?

- 1 yes
- 2 no

 If yes, please briefly outline.

16. Does your system include any methods of assessing cost of ADRs?

1 yes

2 no

17. Does ADR reporting comprise part of your training program for new pharmacists?

1 yes

2 no



If yes, what form of information is provided?

18. How many ADR reports did your HOSPITAL send to the Australian Adverse Drug Advisory Committee (ADRAC) in 2000?

1 none

4 11 - 20

2 1 - 5

5 more than 20

3 6 - 10

6 don't know

19. How many ADR reports did your DEPARTMENT send to ADRAC in 2000?

1 none

4 11 - 20

2 1 - 5

5 more than 20

3 6 - 10

6 don't know

20. If an ADR occurs, who usually advises the patient? (Please tick more than one answer if appropriate)

1 Doctors

4 Nurses

2 Pharmacists

5 Not done

3 Other, please specify _____

21. How is the patient informed? (Please tick more than one answer if appropriate)

1 Verbal

4 Letter

2 Card

5 Not done

3 Other, please specify _____

22. Who is responsible for notifying the GP? (Please tick more than one answer if appropriate)

1 Not done

4 Pharmacists

2 Doctors

5 Nurses

3 Other, please specify _____

23. How is the GP informed? (Please tick more than one answer if appropriate)

1 Discharge summary

4 Via patient

2 Letter

5 Not done

3 Other, please specify _____

24. Is the patient's community pharmacist notified?

1 yes

2 no



If yes, how is the pharmacist informed?

3 Letter

4 Other, please specify _____

25. What is the feedback mechanism to individual hospital staff who complete an ADR report?

- 1 Individual Letter
2 Preprinted letter
3 Not done
4 Other, please specify _____

26. Do you think feedback should be provided?

- 1 yes
2 no



If yes, what method is appropriate?

(Please tick more than one answer if appropriate)

- 3 Letter
4 E-mail
5 Verbal
6 Other, please specify _____

27. What communication method is used to provide general feedback on ADR reports to staff within the HOSPITAL? (Please tick more than one answer if appropriate)

- 1 Bulletin board
2 Drug Bulletin
3 Report to the ward
4 Presentation
5 Not done
6 Other, please specify _____

28. Which communication method is the most appropriate for general feedback to hospital staff?

(Please tick more than one answer if appropriate)

- 1 Drug Bulletin
2 Report to the ward
3 Other, please specify _____
4 Presentation
5 Bulletin board

29. Is there any reward/fee for reporting ADRs in your hospital?

- 1 yes
2 no



If there is any reward, please specify.

30. Do you think it is appropriate to give a reward/fee?

- 1 yes
2 no

31. Do you think the ADRAC Bulletin would be better sent through e-mail?

- 1 yes
2 no

32. Do you think it is important to receive other information beside ADRAC Bulletin from ADRAC?

- 1 yes
2 no



If yes, please specify _____

List of documents attached:

- Copy of **complete pharmacy staff list**.

To assist us in circulating a brief questionnaire to all hospital pharmacists in Western Australia, please provide a copy of your complete pharmacy staff list including all part-time, sessional and locum pharmacists. This will be treated as confidential information and used only for distribution of an ADR questionnaire via your department.

- Copy of **Hospital Policy** in ADR reporting, as appropriate.
- Copy of **Department Policy** in ADR reporting, as appropriate.
- Approval of the release of the number of ADR reports from ADRAAC (please sign below).

PLEASE NOTE:

In order to obtain the total number of ADR reports from your hospital to ADRAAC in 2000, we need your approval. Please sign below if you are willing to approve release of these data to the investigators. Note: Patient specific information will not be provided to the investigators by ADRAAC.

I approve the release of the number of ADR reports in 2000 to the project investigators.

Name : _____

Position : _____

Hospital Name : _____

Date : _____

Signature : _____

- I wish to receive the executive summary/abstract of the study (available January 2002).

End of Questionnaire

Thank you for your co-operation

ADR Questionnaire (Doctor) 2001

Ms Yunita, Dr Kevin Batty, Mr Richard Plumridge

Curtin

UNIVERSITY OF TECHNOLOGY
School of Pharmacy
GPO Box U1987
Perth 6845
WESTERN AUSTRALIA

Section A : General Information

- Gender: 1 Female 2 Male
- How long have you been registered? _____ year(s)
- How long have you been working in hospital practice? _____ year(s)
- Which broad classification best describes your current area of practice?
 - General medicine
 - Surgery
 - Psychiatry
 - Obs/Gyn
 - Paediatric
 - Other, please specify _____
- Which category best describes your status?
 - Consultant
 - Registrar
 - Other, please specify _____
 - Resident
 - General Practitioner
- Which hospital is your principal place of work? (optional) _____

Section B : Adverse Drug Reaction (ADR) Reporting

- Do you know how to report an Adverse Drug Reaction (ADR) within your hospital?
 - yes
 - no
- Do you know how to report an ADR to the Australian Adverse Drug Reaction Advisory Committee (ADRAC)?
 - yes, *If yes, please go to question 3 and complete the entire questionnaire.*
 - no, *If you answered no to both questions 1 and 2, please go to Section C of the questionnaire on page 4 (questions 19-21)*
If you answered yes to question 1 and no to question 2, please continue with question 3 and complete the entire questionnaire.
- Did you receive information regarding ADR reporting when you commenced at this hospital?
 - yes
 - no
 - don't remember

↪ If yes, what type of information?

 - Written information in medical handbook
 - Written information during orientation program
 - Verbal information
 - Other, please specify _____
- Do you think the system for reporting ADRs in your hospital is adequate?
 - yes
 - no
 - don't know

5. Who do you think should be responsible for documenting ADR reports in the hospital?

(Please tick more than one answer if appropriate)

- 1 Doctor 2 Nurse 3 Pharmacist
4 Other, *please specify* _____

6. Who do you think should be responsible for submitting ADR reports to ADRAC?

(Please tick more than one answer if appropriate)

- 1 Doctor 2 Nurse 3 Pharmacist
4 Other, *please specify* _____

7. Do you think ADR reports should be screened by a designated person before being sent to ADRAC?

- 1 yes 2 no

 If yes, who do you think should be responsible for ADR screening?

- 3 Doctor 5 Nurse
4 Pharmacist 6 Other, _____

8. Would you consult with a pharmacist regarding any ADR that you encountered/reported?

- 1 yes 2 no

9. Did you submit any ADR reports to ADRAC in 2000?

- 1 yes 2 no

 If yes, how many?

- 3 One 4 Two - Five 5 > Five

10. Is there any reward/fee provided for reporting ADRs in your hospital?

- 1 yes 2 no

11. Do you think a reward/fee should be provided for reporting an ADR in your hospital?

- 1 yes 2 no

12. Is there any acknowledgment for reporting an ADR in your hospital?

- 1 yes 2 no

13. Do you think an acknowledgment should be provided for reporting an ADR in your hospital?

- 1 yes 2 no

14. Where can you get an ADRAC form (blue card) in your hospital? (Please tick more than one answer if appropriate)

- 1 Available in the ward
 2 Through pharmacy department
 3 Other, please specify _____

15. Which of the following sources contain an ADRAC form (blue card)?

(Cards are available from more than one source, please tick more than one answer if appropriate)

- 1 MIMS
 2 AMH
 3 Schedule of Pharmaceutical Benefits
 4 ADRAC Bulletin
 5 ADRAC web page

16. Which of the following sources do you think should contain the blue card?

(Please tick more than one answer if appropriate)

- 1 MIMS
 2 AMH
 3 Schedule of Pharmaceutical Benefits
 4 ADRAC Bulletin
 5 ADRAC web page
 6 Other, _____

17. Which factors would ENCOURAGE you to report ADRs

- | | Agree | Disagree |
|---|----------------------------|----------------------------|
| a. Seriousness of the reaction | 1 <input type="checkbox"/> | 2 <input type="checkbox"/> |
| b. Unusual reaction | 1 <input type="checkbox"/> | 2 <input type="checkbox"/> |
| c. Reaction to a new product | 1 <input type="checkbox"/> | 2 <input type="checkbox"/> |
| d. Confidence in the diagnosis of the ADR | 1 <input type="checkbox"/> | 2 <input type="checkbox"/> |
| e. Other, please specify _____ | | |

18. Which factors would DISCOURAGE you to report ADRs

- | | Agree | Disagree |
|--|----------------------------|----------------------------|
| a. Uncertain association | 1 <input type="checkbox"/> | 2 <input type="checkbox"/> |
| b. Too trivial to report | 1 <input type="checkbox"/> | 2 <input type="checkbox"/> |
| c. Too well known to report | 1 <input type="checkbox"/> | 2 <input type="checkbox"/> |
| d. Unsure how to report | 1 <input type="checkbox"/> | 2 <input type="checkbox"/> |
| e. The system is too bureaucratic | 1 <input type="checkbox"/> | 2 <input type="checkbox"/> |
| f. Not enough time to fill in a report | 1 <input type="checkbox"/> | 2 <input type="checkbox"/> |
| g. Concern that a report will require extra work | 1 <input type="checkbox"/> | 2 <input type="checkbox"/> |
| h. Report form not readily available | 1 <input type="checkbox"/> | 2 <input type="checkbox"/> |
| i. Concern about patient confidentiality | 1 <input type="checkbox"/> | 2 <input type="checkbox"/> |
| j. Concern about legal liability | 1 <input type="checkbox"/> | 2 <input type="checkbox"/> |
| k. Level of drug knowledge not adequate | 1 <input type="checkbox"/> | 2 <input type="checkbox"/> |
| l. Want to publish report in biomedical literature | 1 <input type="checkbox"/> | 2 <input type="checkbox"/> |
| m. Other, please specify _____ | | |

Section C : ADR Hypothetical Questions

19. Please indicate which hypothetical ADRs you would report?

	Yes	No
a. Jaundice with frusemide	1 <input type="checkbox"/>	2 <input type="checkbox"/>
b. Agranulocytosis after spironolactone	1 <input type="checkbox"/>	2 <input type="checkbox"/>
c. Headache with venlafaxine	1 <input type="checkbox"/>	2 <input type="checkbox"/>
d. Weight loss with venlafaxine	1 <input type="checkbox"/>	2 <input type="checkbox"/>
e. Thrombocytopenia with heparin	1 <input type="checkbox"/>	2 <input type="checkbox"/>
f. Thrombocytopenia with enoxaparin	1 <input type="checkbox"/>	2 <input type="checkbox"/>
g. Duodenal ulcer with celecoxib	1 <input type="checkbox"/>	2 <input type="checkbox"/>
h. Duodenal ulcer with diclofenac	1 <input type="checkbox"/>	2 <input type="checkbox"/>
i. Toxic epidermal necrolysis with tramadol	1 <input type="checkbox"/>	2 <input type="checkbox"/>
j. Constipation with tramadol	1 <input type="checkbox"/>	2 <input type="checkbox"/>
k. Nausea with montelukast	1 <input type="checkbox"/>	2 <input type="checkbox"/>
l. DVT after oral contraceptive	1 <input type="checkbox"/>	2 <input type="checkbox"/>
m. Cold extremities with β -adrenoreceptor blockers	1 <input type="checkbox"/>	2 <input type="checkbox"/>
n. Neutropenia with ACE Inhibitor	1 <input type="checkbox"/>	2 <input type="checkbox"/>
o. Rhabdomyolysis with cerivastatin	1 <input type="checkbox"/>	2 <input type="checkbox"/>

20. Do you receive the ADRAC Bulletin regularly by mail?

1 yes 2 no

21. Do you think the ADRAC Bulletin would be better sent through e-mail?

1 yes 2 no

End of Questionnaire

Thank you for your co-operation

ADR Questionnaire (Pharmacist) 2001

Ms Yunita, Dr Kevin Batty, Mr Richard Plumridge

Curtin

SCHOOL OF PHARMACY
School of Pharmacy
GPO Box U1987
Perth 6845
WESTERN AUSTRALIA

Section A : General Information

- Gender: 1 Female 2 Male
- How long have you been registered? _____ year(s)
- How long have you been working in hospital practice? _____ year(s)
- What area do you currently work? (Please indicate only one category which best describes your role)
 - Clinical Pharmacy
 - Manufacturing
 - Drug Information
 - Dispensary
 - Administration
 - Other, please specify _____
- Which hospital is your principal place of work? (optional) _____

Section B : Adverse Drug Reaction (ADR) Reporting

- Do you know how to report an Adverse Drug Reaction (ADR) within your hospital?
 - yes
 - no
- Do you know how to report an ADR to the Australian Adverse Drug Reaction Advisory Committee (ADRAC)?
 - yes, *If yes, please go to question 3 and complete the entire questionnaire.*
 - no, *If you answered no to both questions 1 and 2, please go to Section C of the questionnaire on page 4 (questions 19-21)*
If you answered yes to question 1 and no to question 2, please continue with question 3 and complete the entire questionnaire.
- Did you receive information regarding ADR reporting when you commenced at this hospital?
 - yes
 - no
 - don't remember

↩ If yes, what type of information?

 - Written information in pharmacy handbook
 - Written information during orientation program
 - Verbal information
 - Other, please specify _____
- Do you think the system for reporting ADRs in your hospital is adequate?
 - yes
 - no
 - don't know
- Who do you think should be responsible for documenting ADR reports in the hospital?
(Please tick more than one answer if appropriate)
 - Doctor
 - Nurse
 - Pharmacist
 - Other, please specify _____

6. Who do you think should be responsible for submitting ADR reports to ADRAC?

(Please tick more than one answer if appropriate)

- 1 Doctor 2 Nurse 3 Pharmacist
4 Other, *please specify* _____

7. Do you think ADR reports should be screened by a designated person before being sent to ADRAC?

- 1 yes 2 no

 **If yes, who do you think should be responsible for ADR screening?**

- 3 Doctor 5 Nurse
4 Pharmacist 6 Other, _____

8. Would you consult with a doctor regarding any ADR that you encountered/reported?

- 1 yes 2 no

9. Did you submit any ADR reports to ADRAC in 2000?

- 1 yes 2 no

 **If yes, how many?**

- 3 One 4 Two - Five 5 > Five

10. Is there any reward/fee provided for reporting ADRs in your hospital?

- 1 yes 2 no

11. Do you think a reward/fee should be provided for reporting an ADR in your hospital?

- 1 yes 2 no

12. Is there any acknowledgment for reporting an ADR in your hospital?

- 1 yes 2 no

13. Do you think acknowledgment should be provided for reporting an ADR in your hospital?

- 1 yes 2 no

14. Where can you get an ADRAC form (blue card) in your hospital? *(Please tick more than one answer if appropriate)*

- 1 Available in the ward 2 Through pharmacy department
3 Other, *please specify* _____

15. Which of the following sources contain an ADRAC form (blue card)? *(Cards are available from more than one source, please tick more than one answer if appropriate)*

- 1 MIMS 4 ADRAC Bulletin
2 Australian Medicines Handbook (AMH) 5 ADRAC web page
3 Schedule of Pharmaceutical Benefits

16. Which of the following sources do you think should contain the blue card?

(Please tick more than one answer if appropriate)

- | | |
|--|---|
| 1 <input type="checkbox"/> MIMS | 4 <input type="checkbox"/> ADRAC Bulletin |
| 2 <input type="checkbox"/> AMH | 5 <input type="checkbox"/> ADRAC web page |
| 3 <input type="checkbox"/> Schedule of Pharmaceutical Benefits | 6 <input type="checkbox"/> Other, _____ |

17. Which factor(s) would ENCOURAGE you to report ADRs

- | | Agree | Disagree |
|---|----------------------------|----------------------------|
| a. Seriousness of the reaction | 1 <input type="checkbox"/> | 2 <input type="checkbox"/> |
| b. Unusual reaction | 1 <input type="checkbox"/> | 2 <input type="checkbox"/> |
| c. Reaction to a new product | 1 <input type="checkbox"/> | 2 <input type="checkbox"/> |
| d. Confidence in the diagnosis of the ADR | 1 <input type="checkbox"/> | 2 <input type="checkbox"/> |
| e. Other, <i>please specify</i> _____ | | |

18. Which factor(s) would DISCOURAGE you to report ADRs

- | | Agree | Disagree |
|--|----------------------------|----------------------------|
| a. Uncertain association | 1 <input type="checkbox"/> | 2 <input type="checkbox"/> |
| b. Too trivial to report | 1 <input type="checkbox"/> | 2 <input type="checkbox"/> |
| c. Too well known to report | 1 <input type="checkbox"/> | 2 <input type="checkbox"/> |
| d. Unsure how to report | 1 <input type="checkbox"/> | 2 <input type="checkbox"/> |
| e. The system is too bureaucratic | 1 <input type="checkbox"/> | 2 <input type="checkbox"/> |
| f. Not enough time to fill in a report | 1 <input type="checkbox"/> | 2 <input type="checkbox"/> |
| g. Concern that a report will require extra work
(e.g. Liaison with doctor, patient, etc) | 1 <input type="checkbox"/> | 2 <input type="checkbox"/> |
| h. Report form not readily available | 1 <input type="checkbox"/> | 2 <input type="checkbox"/> |
| i. Concern about patient confidentiality | 1 <input type="checkbox"/> | 2 <input type="checkbox"/> |
| j. Concern about legal liability | 1 <input type="checkbox"/> | 2 <input type="checkbox"/> |
| k. Lack of confidence in discussing with doctor | 1 <input type="checkbox"/> | 2 <input type="checkbox"/> |
| l. Level of drug knowledge not adequate | 1 <input type="checkbox"/> | 2 <input type="checkbox"/> |
| m. Want to publish report in biomedical literature | 1 <input type="checkbox"/> | 2 <input type="checkbox"/> |
| n. Other, <i>please specify</i> _____ | | |

Section C : ADR Hypothetical Questions

19. Please indicate which hypothetical ADRs you would report?

	Yes	No
a. Jaundice with frusemide	1 <input type="checkbox"/>	2 <input type="checkbox"/>
b. Agranulocytosis after spironolactone	1 <input type="checkbox"/>	2 <input type="checkbox"/>
c. Headache with venlafaxine	1 <input type="checkbox"/>	2 <input type="checkbox"/>
d. Weight loss with venlafaxine	1 <input type="checkbox"/>	2 <input type="checkbox"/>
e. Thrombocytopenia with heparin	1 <input type="checkbox"/>	2 <input type="checkbox"/>
f. Thrombocytopenia with enoxaparin	1 <input type="checkbox"/>	2 <input type="checkbox"/>
g. Duodenal ulcer with celecoxib	1 <input type="checkbox"/>	2 <input type="checkbox"/>
h. Duodenal ulcer with diclofenac	1 <input type="checkbox"/>	2 <input type="checkbox"/>
i. Toxic epidermal necrolysis with tramadol	1 <input type="checkbox"/>	2 <input type="checkbox"/>
j. Constipation with tramadol	1 <input type="checkbox"/>	2 <input type="checkbox"/>
k. Nausea with montelukast	1 <input type="checkbox"/>	2 <input type="checkbox"/>
l. DVT after oral contraceptive	1 <input type="checkbox"/>	2 <input type="checkbox"/>
m. Cold extremities with β -adrenoreceptor blockers	1 <input type="checkbox"/>	2 <input type="checkbox"/>
n. Neutropenia with ACE Inhibitor	1 <input type="checkbox"/>	2 <input type="checkbox"/>
o. Rhabdomyolysis with cerivastatin	1 <input type="checkbox"/>	2 <input type="checkbox"/>

20. Do you receive the ADRAC Bulletin regularly by mail?

1 yes 2 no

21. Do you think the ADRAC Bulletin would be better sent through e-mail?

1 yes 2 no

End of Questionnaire
Thank you for your co-operation

Appendix 5: Cover Letter

Dr Kevin Batty

Lecturer

Telephone: 9266 3941

Facsimile: 9266 2769

Email: Kevin.Batty@curtin.edu.au

Curtin

UNIVERSITY OF TECHNOLOGY

School of Pharmacy

Curtin University of Technology

GPO Box U1987

Perth 6845 WESTERN AUSTRALIA

Date

Name &

Address of

Chief Pharmacist (outside WA)

Dear Mr/Ms XXX

Survey - Adverse Drug Reaction (ADR) Reporting

We are conducting a study of ADR reporting in Australia, as part of a Master of Pharmacy degree project. The aim is to document current practices and identify methods to improve ADR reporting in Australian hospitals. We seek your assistance in providing information to complete this study.

The project has been endorsed by ADRAC and the questionnaire has been reviewed by Dr John McEwen, Director of the Adverse Drug Reactions Unit. This study also has been approved by the Curtin University Human Research Ethics Committee (Approval Number HR 97/2001⁵). As there is very little identifying information required in this survey, return of the questionnaire indicates your consent to participate in the study.

Please find enclosed the questionnaire, which will take 10-15 minutes to complete.

- Most of the questions simply require a box to be ticked.
- To assist with our analysis of the data, this is *not* an anonymous questionnaire. However, the last page will be detached when we receive your response and a confidential code will be used to identify the responses. The code will be held by Dr Batty in secure storage.
- We would appreciate receiving a copy of your **hospital** and **departmental** ADR policies. If they are the same, please indicate that when you return the questionnaire. These will be treated as confidential documents.
- To assist with a review of ADR reports submitted to ADRAC, we would like to know the number of reports submitted from your hospital in 2000. This information can be obtained from ADRAC with your approval and we request that you sign the authority at the end of the questionnaire.

We appreciate your assistance and would be grateful to receive the questionnaire and requested documentation in the enclosed self-addressed envelope by Friday 29 June 2001.

Kind regards,

Ms Nita Yunita
MPharm Student
Curtin University

Dr Kevin Batty
Lecturer
Supervisor

Mr Richard Plumridge
Director of Pharmacy
Fremantle Hospital & Health Service

⁵ If needed, verification of approval can be obtained either by writing to the Secretary, Curtin University Human Research Ethics Committee, c/- Office of Research and Development, Curtin University of Technology, GPO Box U1987, Perth, 6845 or by telephoning 9266 2784.

Dr Kevin Batty

Lecturer

Telephone: 9266 3941

Facsimile: 9266 2769

Email: Kevin.Batty@curtin.edu.au

Curtin

UNIVERSITY OF TECHNOLOGY

School of Pharmacy

Curtin University of Technology

GPO Box U1987

Perth 6845 WESTERN AUSTRALIA

Date

Name &

Address of

Chief Pharmacist (**WA only**)

Dear Mr/Ms XXX

Survey - Adverse Drug Reaction (ADR) Reporting

We are conducting a study of ADR reporting in Australia, as part of a Master of Pharmacy degree project. The aim is to document current practices and identify methods to improve ADR reporting in Australian hospitals. We seek your assistance in providing information to complete this study.

The project has been endorsed by ADRAC and the questionnaire has been reviewed by Dr John McEwen, Director of the Adverse Drug Reactions Unit. This study also has been approved by the Curtin University Human Research Ethics Committee (Approval Number HR 97/2001⁵). As there is very little identifying information required in this survey, return of the questionnaire indicates your consent to participate in the study.

Please find enclosed the questionnaire, which will take 10-15 minutes to complete.

- Most of the questions simply require a box to be ticked.
- To assist with our analysis of the data, this is *not* an anonymous questionnaire. However, the last page will be detached when we receive your response and a confidential code will be used to identify the responses. The code will be held by Dr Batty in secure storage.
- We would appreciate receiving a copy of your **hospital** and **departmental** ADR policies. If they are the same, please indicate that when you return the questionnaire. These will be treated as confidential documents.
- To assist with a review of ADR reports submitted to ADRAC, we would like to know the number of reports submitted from your hospital in 2000. This information can be obtained from ADRAC with your approval and we request that you sign the authority at the end of the questionnaire.
- We plan to survey all practising hospital pharmacists in WA and request that you supply a list of all pharmacists who work in your department, including part-time and locum pharmacists. The questionnaire will be distributed in individually addressed envelopes via your department.

We appreciate your assistance and would be grateful to receive the questionnaire and requested documentation in the enclosed self-addressed envelope by Friday 29 June 2001.

Kind regards,

Ms Nita Yunita
MPharm Student
Curtin University

Dr Kevin Batty
Lecturer
Supervisor

Mr Richard Plumridge
Director of Pharmacy
Fremantle Hospital & Health Service

⁵ If needed, verification of approval can be obtained either by writing to the Secretary, Curtin University Human Research Ethics Committee, c/- Office of Research and Development, Curtin University of Technology, GPO Box U1987, Perth, 6845 or by telephoning 9266 2784.

Dr Kevin Batty

Lecturer

Telephone: 9266 3941

Facsimile: 9266 2769

Email: Kevin.Batty@curtin.edu.au

Curtin

UNIVERSITY OF TECHNOLOGY

School of Pharmacy

Curtin University of Technology

GPO Box U1987

Perth 6845 WESTERN AUSTRALIA

Date

Name &

Address of

Doctor

Dear Doctor XXX

Survey - Adverse Drug Reaction (ADR) Reporting

We are conducting a study of ADR reporting in Australia, as part of a Master of Pharmacy degree project. The aim is to document current practices and identify methods to improve ADR reporting in Australian hospitals. We seek your assistance in providing information to complete this study.

The project has been endorsed by ADRAC and the questionnaire has been reviewed by Dr John McEwen, Director of the Adverse Drug Reactions Unit. This study also has been approved by the Curtin University Human Research Ethics Committee (Approval Number HR 97/2001[§]). As there is very little personal information required in this survey, return of the questionnaire indicates your consent to participate in the study.

Please find enclosed the questionnaire, which will take 6-8 minutes to complete. Most of the questions simply require a box to be ticked.

We appreciate your assistance and would be grateful to receive the questionnaire in the enclosed self-addressed envelope by Friday 29 June 2001.

Kind regards,

Ms Nita Yunita

MPharm Student

Curtin University

Dr Kevin Batty

Lecturer

Supervisor

Mr Richard Plumridge

Director of Pharmacy

Fremantle Hospital & Health Service

[§] If needed, verification of approval can be obtained either by writing to the Secretary, Curtin University Human Research Ethics Committee, c/- Office of Research and Development, Curtin University of Technology, GPO Box U1987, Perth, 6845 or by telephoning 9266 2784.

Dr Kevin Batty

Lecturer

Telephone: 9266 3941

Facsimile: 9266 2769

Email: Kevin.Batty@curtin.edu.au

Curtin

UNIVERSITY OF TECHNOLOGY

School of Pharmacy

Curtin University of Technology

GPO Box U1987

Perth 6845 WESTERN AUSTRALIA

Date

Name &
Address of
Pharmacist

Dear Mr/Ms XXX

Survey - Adverse Drug Reaction (ADR) Reporting

We are conducting a study of ADR reporting in Australia, as part of a Master of Pharmacy degree project. The aim is to document current practices and identify methods to improve ADR reporting in Australian hospitals. We seek your assistance in providing information to complete this study.

The project has been endorsed by ADRAC and the questionnaire has been reviewed by Dr John McEwen, Director of the Adverse Drug Reactions Unit. This study also has been approved by the Curtin University Human Research Ethics Committee (Approval Number HR 97/2001⁵). As there is very little personal information required in this survey, return of the questionnaire indicate your consent to participate in the study.

Please find enclosed the questionnaire, which will take 6-8 minutes to complete. Most of the questions simply require a box to be ticked. If you are not practising in pharmacy, or the questionnaire does not appear to be relevant to your current practice, please return the questionnaire with 'N/A' marked clearly on the front page. However, please note that you are very welcome to complete the back page of the questionnaire and the responses will be included in our report.

We appreciate your assistance and would be grateful to receive the questionnaire in the enclosed self-addressed envelope by Monday 27 August 2001.

Kind regards,

Ms Nita Yunita
MPharm Student
Curtin University

Dr Kevin Batty
Lecturer
Supervisor

Mr Richard Plumridge
Director of Pharmacy
Fremantle Hospital & Health Service

⁵ If needed, verification of approval can be obtained either by writing to the Secretary, Curtin University Human Research Ethics Committee, c/- Office of Research and Development, Curtin University of Technology, GPO Box U1987, Perth, 6845 or by telephoning 9266 2784.

Appendix 6: Data Collection Form (Penicillin)

Data Collection Form

Code :

Date of Birth : / /

Sex : Female Male

Penicillin allergy

Drug Name :

Starting date : / /

Type of allergy :

History of previous allergy :

Skin test : Yes No

Drug alert : Front cover
 Inside cover
 Brief explanation in inside cover
 Triage assessment
 Emergency department record
 Medication chart

Admission and Reason for Admission :

Past Medical History :

Note :

Other Medication

Drug	Dose & Route	Reason	Date	Allergy	Type

Note :