



EYE EMERGENCY MANUAL PROJECT REPORT

Introduction and Evaluation of the Eye Emergency Clinical Guidelines published in the Eye
Emergency Manual

May 2010

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The Statewide Ophthalmology Service (SOS) a network of the Greater Metropolitan Clinical Taskforce (GMCT) developed the eye emergency consensus clinical guidelines which were published in the Eye Emergency Manual in February 2007. Funding was provided by GMCT for a project to introduce the guidelines into NSW public hospital emergency departments and evaluate improvement in care. The project commenced in late 2007 and was completed at the end of 2008.

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TABLE OF CONTENTS

1	<u>EXECUTIVE SUMMARY</u>	<u>8</u>
2	<u>INTRODUCTION.....</u>	<u>10</u>
2.1	PROJECT PROPOSAL.....	10
2.2	PROJECT AIMS.....	10
3	<u>METHODOLOGY.....</u>	<u>10</u>
3.1	PROJECT STRUCTURE	10
3.2	SITE SELECTION	10
3.3	SITE PROJECT TEAMS	11
3.4	CLINICAL PRACTICE IMPROVEMENT METHODOLOGY.....	11
3.5	AUDIT TOOL DEVELOPMENT	12
3.6	PROJECT RESOURCES.....	13
3.6.1	MEDICAL EDUCATION	13
3.6.2	NURSING EDUCATION.....	13
3.6.3	TRAIN THE TRAINER EDUCATION	14
3.6.4	SLIT LAMP EDUCATION.....	14
3.7	OPHTHALMOLOGIST REFERRAL SURVEY	14
4	<u>PROBLEMS IDENTIFIED AND SOLUTIONS APPLIED.....</u>	<u>15</u>
4.1	CLINICAL PRACTICE IMPROVEMENT	15
4.1.1	SLIT LAMP	15
4.1.2	EYE EXAMINATION AREA SET UP.....	16
4.1.3	VISUAL ACUITY TESTING.....	16
4.1.4	PH TESTING.....	17
4.1.5	PAIN RELIEF FOR PATIENTS	17
4.1.6	TRIAGE CATEGORY 2 PATIENT FLOW - EYE EMERGENCIES	17
4.1.7	IRRIGATION	18
4.1.8	TRIAGE CATEGORIES	18
4.2	DOCUMENTATION	18
4.3	EDUCATION	19
4.3.1	EMERGENCY DEPARTMENT CLINICIAN EDUCATION	19
4.3.2	MEDICAL EDUCATION	19
4.3.3	TRAIN THE TRAINER EDUCATION	19

4.3.4	SLIT LAMP EDUCATION.....	20
4.4	RESULTS OF OPHTHALMOLOGIST REFERRAL SURVEY.....	20
5	<u>AUDIT RESULTS</u>	<u>21</u>
5.1	DATA SETS	21
5.2	DIAGNOSIS GROUPINGS	22
5.3	AUDIT RESULTS – DATA SET #1	22
5.3.1	AGE RANGE	22
5.3.2	PROVISIONAL DIAGNOSIS/ PRESENTING SYMPTOM	23
5.3.3	HISTORY	25
5.3.4	EXAMINATION.....	28
5.3.5	MANAGEMENT.....	30
5.3.6	SEPARATION	32
5.3.7	FOLLOW UP	32
5.4	AUDIT RESULTS – DATA SET #2	33
5.4.1	SEEN BY.....	33
5.4.2	EXAMINATION – USE OF SLIT LAMP	35
5.4.3	MANAGEMENT - USE OF LOCAL ANAESTHETIC	35
5.5	SUMMARY OF AUDIT FINDINGS.....	36
6	<u>DISCUSSION.....</u>	<u>37</u>
6.1	CLINICAL PRACTICE IMPROVEMENT	37
6.2	MANDATORY & ROUTINE DOCUMENTATION.....	38
6.2.1	TRIAGE.....	39
6.2.2	ATTENDING CLINICIAN ISSUES AND PATIENT FOLLOW UP.....	41
6.3	DOCUMENTATION OF EYE EMERGENCY PATIENT DATA ITEMS	43
7	<u>PROJECT FORUM.....</u>	<u>49</u>
8	<u>RECOMMENDATIONS.....</u>	<u>50</u>
9	<u>SUMMARY.....</u>	<u>51</u>

LIST OF TABLES

TABLE 1: HOSPITAL PEER GROUPS	11
TABLE 2: USE OF DIFFERENT AUDIT TOOLS BY SITES	12
TABLE 3: EYE EMERGENCY CLINICIAN EDUCATION PRESENTATIONS	13
TABLE 4: RECOMMENDED CHANGES TO TRIAGE CATEGORIES.....	18
TABLE 5: OVERVIEW OF GROUPS BY DATA SET AND AUDIT TOOL VERSION	21
TABLE 8: AGE RANGE OF PATIENTS SEEN	23
TABLE 9: FREQUENCY OF ED PRESENTATION BY DIAGNOSIS	23
TABLE 10: APPROPRIATENESS OF TRIAGE CATEGORIES APPLIED TO FOUR DESIGNATED DIAGNOSES	24
TABLE 11: APPLICATION OF RECOMMENDED TRIAGE CATEGORY BY AGE AND DIAGNOSIS	25
TABLE 12: PERCENTAGE DOCUMENTED (%D) OF ASPECTS OF HISTORY – ALL DIAGNOSES	25
TABLE 13: PERCENTAGE DOCUMENTED (%D) OF ASPECTS OF HISTORY IN AUDITS WITH A DIAGNOSIS OF <i>T: FOREIGN BODY</i>	26
TABLE 14: PERCENTAGE DOCUMENTED (%D) OF ASPECTS OF HISTORY IN AUDITS WITH A DIAGNOSIS OF <i>ARE: PAINFUL, DIFFUSE CONJUNCTIVAL INJECTION</i>	26
TABLE 15: PERCENTAGE DOCUMENTED (%D) OF ASPECTS OF HISTORY IN AUDITS WITH A DIAGNOSIS OF <i>ARE: PAINFUL, CORNEA ABNORMAL</i>	27
TABLE 16: PERCENTAGE DOCUMENTED (%D) OF ASPECTS OF HISTORY IN AUDITS WITH A DIAGNOSIS OF <i>T: CHEMICAL BURN</i>	27
TABLE 17: PERCENTAGE DOCUMENTED (%D) OF ASPECTS OF EXAMINATION – ALL DIAGNOSES .	28
TABLE 18: PERCENTAGE DOCUMENTED (%D) OF ASPECTS OF EXAMINATION WITH A DIAGNOSIS OF <i>T: FOREIGN BODY</i>	28
TABLE 19: PERCENTAGE DOCUMENTED (%D) OF ASPECTS OF EXAMINATION IN AUDITS WITH A DIAGNOSIS OF <i>ARE: PAINFUL, DIFFUSE CONJUNCTIVAL INJECTION</i>	29
TABLE 20: PERCENTAGE DOCUMENTED (%D) OF ASPECTS OF EXAMINATION IN AUDITS WITH A DIAGNOSIS OF <i>ARE: PAINFUL, CORNEA ABNORMAL</i>	29
TABLE 21: PERCENTAGE DOCUMENTED (%D) OF ASPECTS OF EXAMINATION OF AUDITS WITH A DIAGNOSIS OF <i>T: CHEMICAL BURN</i>	29
TABLE 22: PERCENTAGE DOCUMENTED (%D) OF ANALGESIA – ALL DIAGNOSES	30
TABLE 23: PERCENTAGE DOCUMENTED (%D) OF ASPECTS OF MANAGEMENT IN AUDITS WITH A DIAGNOSIS OF <i>T: FOREIGN BODY</i>	30
TABLE 24: PERCENTAGE DOCUMENTED (%D) OF ASPECT OF MANAGEMENT WITH A DIAGNOSIS OF <i>ARE: PAINFUL, DIFFUSE CONJUNCTIVAL INJECTION</i>	30
TABLE 25: PERCENTAGE DOCUMENTED (%D) OF ASPECTS OF MANAGEMENT WITH A DIAGNOSIS OF <i>ARE: PAINFUL, CORNEA ABNORMAL</i>	30
TABLE 26: PERCENTAGE DOCUMENTED (%D) OF ASPECTS OF MANAGEMENT OF AUDITS WITH A DIAGNOSIS OF <i>T: CHEMICAL BURN</i>	31
TABLE 27: PERCENTAGE DOCUMENTED (%D) OF ASPECTS OF MANAGEMENT FOR FOUR DIAGNOSES – DRUGS.....	31
TABLE 28: SEPARATION PATTERNS FOR ALL DIAGNOSES.....	32
TABLE 29: SEPARATION PATTERNS FOR FOUR DIAGNOSES	32
TABLE 30: DOCUMENTED FOLLOW UP.....	32
TABLE 31: PATIENT ENCOUNTERS WITH ONE OR MORE CLINICIANS.....	33

TABLE 32: PATIENT ENCOUNTERS WITH CLINICIANS BY DESIGNATION.....	33
TABLE 33: <i>T: CHEMICAL BURN</i> – DESIGNATION OF CLINICIAN WHEN PATIENT SEEN BY TWO CLINICIANS.....	34
TABLE 34: <i>T: FOREIGN BODY</i> – DESIGNATION OF CLINICIAN WHEN PATIENT SEEN BY TWO CLINICIANS.....	34
TABLE 35: DOCUMENTED USE OF SLIT LAMP.....	35
TABLE 36: USE OF LOCAL ANAESTHETIC.....	35
TABLE 37: % DOCUMENTED IMPROVEMENT FOLLOWING IMPLEMENTATION OF IDENTIFIED SOLUTIONS.....	37
TABLE 38: SUMMARY OF SIGNIFICANT IMPROVEMENT FOR HISTORY AND EXAMINATION DATA ITEMS.....	45

LIST OF FIGURES

FIGURE 1: %DOCUMENTED OF EXAMINATION AND MANAGEMENT DATA ITEMS RECOMMENDED IN THE EEM.....	38
FIGURE 2: DOCUMENTATION OF MANDATORY AND ROUTINE DATA ITEMS.....	39
FIGURE 3: VARIATION IN ASSIGNMENT OF RECOMMENDED ATS CATEGORY FOR 4 SPECIFIC DIAGNOSES.....	39
FIGURE 4: VARIATION FROM RECOMMENDED ATS CATEGORY <i>T: CHEMICAL BURN OF THE EYE/S</i>	40
FIGURE 5: PATIENT ENCOUNTERS WITH CLINICIANS BY DESIGNATION.....	41
FIGURE 6: NUMBER OF CLINICIANS DOCUMENTED AS SEEING THE PATIENT.....	41
FIGURE 7: DOCUMENTED FOLLOW UP.....	42
FIGURE 8: CLINICIANS RECORDED AS SEEING PATIENTS WHO HAVE BEEN REFERRED FOR FOLLOW UP IN OPD EYE CLINIC OR TO AN OPHTHALMOLOGIST.....	42
FIGURE 9: DESIGNATION OF CLINICIANS RECORDED AS ATTENDING THOSE PATIENTS SEEN BY ONE CLINICIAN WHO WERE REFERRED FOR FOLLOW UP BY OPD EYE CLINIC & AN OPHTHALMOLOGIST.....	43
FIGURE 10: TRENDS IN HISTORY DOCUMENTATION FOR ALL DIAGNOSES.....	44
FIGURE 11: HISTORY DOCUMENTATION FOR ALL DIAGNOSES.....	44
FIGURE 12: TRENDS IN EXAMINATION DOCUMENTATION FOR ALL DIAGNOSES.....	45
FIGURE 13: EXAMINATION DOCUMENTATION FOR ALL DIAGNOSES.....	46
FIGURE 14: DOCUMENTATION OF ASPECTS OF HISTORY AND EXAMINATION SHOWING SIGNIFICANT IMPROVEMENT ACROSS FOUR AUDITS FOR ALL DX.....	47
FIGURE 15: DOCUMENTATION OF MEDICATION FOR FOUR SPECIFIC DIAGNOSES.....	48

APPENDICES

APPENDIX 1: PROJECT SITE BY HOSPITAL DESIGNATION 52

APPENDIX 2: AUDIT TOOL (V#3)..... 53

APPENDIX 3: CHANGES TO AUDIT TOOL 54

APPENDIX 4: OPHTHALMOLOGY SURVEY 56

APPENDIX 5: EYE EMERGENCY ASSESSMENT FORM 57

APPENDIX 6: EXAMPLES OF DIAGNOSIS GROUPING 59

APPENDIX 7: APPLICATION OF RECOMMENDED TRIAGE CATEGORIES BY AGE AND
DIAGNOSIS 60

APPENDIX 8: CLINICIAN ENCOUNTERS BY DIAGNOSIS GROUPING 61

1 EXECUTIVE SUMMARY

The consensus based clinical guidelines for the management of eye emergencies published in the Eye Emergency Manual (EEM) were developed by the ophthalmic clinicians of the Provision of Hospital Services Subcommittee (PHSS) in collaboration with the Nurse Standing Committee (NSC), both committees of the NSW Statewide Ophthalmology Service (SOS), a network of the Greater Metropolitan Clinical Taskforce (GMCT).

The guidelines were developed in response to anecdotal evidence that junior medical staff had limited skills to manage eye emergencies and that there was a paucity of education to assist remedy this. Consequently the EEM was designed to assist non-ophthalmic clinicians to manage eye emergencies, particularly in Emergency Departments (EDs) without an ophthalmic presence.

In order to encourage clinician use it was agreed to introduce the manual into EDs with a process to evaluate its effectiveness in improving care for patients who present with eye problems.

Twelve months funding of \$110000 was successfully sought from the SOS and GMCT.

26 Emergency Departments in hospitals with and without an ophthalmic presence participated in the project.

The Eye Emergency Manual project aims:

- To encourage clinician use of the EEM
- To improve the assessment and management of patients presenting to EDs with eye problems
- To evaluate the effectiveness of the EEM in improving patient care for patients presenting to EDs

Project methodology included the use of a modified clinical practice improvement (CPI) framework to identify issues and solutions, and medical record audit to evaluate any changes in the care following the introduction of the clinical guidelines in the EEM. Documentation was used as a surrogate for patient care on the assumption that if care wasn't documented it wasn't provided or identified as not required.

A Project Officer was recruited with responsibilities for coordinating participating sites, setting up multidisciplinary teams, organising project methodology education, organising and contributing to interactive ophthalmic education and communicating with site team leaders.

Levels of documentation ranged between no documentation to very high levels across diagnoses and data items both routinely collected and those specific to history, triage, assessment and management.

The availability of, the encouraged use of, and the introduction of the guidelines in the EEM as an appropriately resourced project, have significantly improved the documentation of aspects of history and examination across audits for all diagnoses. The aspects showing improvement are visual disturbance, red eye, fluorescein, slit lamp, external lids, pupils and visual acuity.

There was no significant improvement in the documentation of the management of eye emergencies.

It was noted that the effect of a specific resource i.e. the EEM on patient care and the documentation of that care was difficult to isolate and identify and as such it was only possible to say that all the project resources including the application of CPI methodology, the provision of the EEM and encouragement to use it, led to the improvement in documentation in some aspects of care and by extrapolation patient care.

The project provided a picture of eye emergency care in NSW Emergency Departments:

- 56% of the caseload can be assigned to three diagnosis groupings of *T: foreign body*, *ARE: painful diffuse conjunctival injection/conjunctivitis*, and *ARE: painful, cornea abnormal* with an additional 4 % classified as *T: chemical burn of the eye/s*.
- 81% of patients were documented as seeing only one clinician with 38% seeing a JMO, 24% a CMO and 16% a Registrar reflecting the staffing mix of EDs in the project
- 92% of patients were discharged home - 81% with documented follow up including referral to a GP (35%) or to an ophthalmologist in rooms or in an outpatient eye clinic (25%).

Recommendations arising from discussion of project findings include the need for sustainable eye emergency clinician education, the need to improve documentation, to undertake a third review of the guidelines to incorporate project findings and identify the issues for appropriate triaging of chemical burn to the eye/s.

RECOMMENDATIONS

- I. Establish a sustainable eye emergency clinician education program based on the Eye Emergency Clinician Education Workshops currently being provided and the guidelines in the EEM for emergency department clinicians.
- II. Consider :
 - expanding the program to include GP's into whose care over one third of patients are discharged
 - continued support for 'Train the Trainer' programs provided at Sydney/Sydney Eye Hospital
 - increased exposure for medical students to eye emergency assessment and management
 - encouraging participation in graduate certificates of nursing specializing in ophthalmic issues for nurses
- III. Incorporate project findings into a sustainable eye emergency clinician education program in particular:
 - the slit lamp and its use, irrigation for chemical burn, and the use of local anaesthetic and analgesia for painful eye conditions
 - the urgency of treatment for chemical burn to the eye/s including appropriate ATS category and ophthalmologist referral
 - education for JMOs as they are frequently the only medical clinician documented as seeing the patient and for GPs who are most likely to be referred patients following attendance at ED
 - encourage the development and implementation of standing orders for local anaesthesia and use of analgesia for painful eye conditions
 - the use of steroids by JMOs, ED clinicians and GPs for eye emergencies
- IV. Undertake a review of the second edition of the clinical guidelines in the EEM prior to further printing in particular the recommended ATS category for *ARE: painful, diffuse conjunctival Injection* and the inclusion of pain relief for common emergencies
- V. Undertake further study to identify the issues which determine the ATS category assigned for chemical burns to the eye/s including appropriateness of the assigned ATS Category.
- VI. Improve the documentation of management of eye emergencies in EDs in general and in particular:
 - the documentation of the attending clinician including the second or more senior attending clinician especially prior to referral to the GP, Ophthalmology rooms or an outpatient eye clinic
 - progress development of the electronic eye assessment chart for inclusion in Firstnet state-wide (ED Information Management System)
 - the provision of an electronically generated referral letter from Firstnet to the GP
 - provide easy electronic access to the eye emergency clinical guidelines in EDs as well as investigating the capacity to download to Smartphones

2 INTRODUCTION

2.1 Project Proposal

The consensus based clinical guidelines for the management of eye emergencies published in the Eye Emergency Manual (EEM) were developed by the ophthalmic clinicians of the Provision of Hospital Services Subcommittee (PHSS) in collaboration with the Nurse Standing Committee (NSC), both committees of the NSW Statewide Ophthalmology Service (SOS), a network of the Greater Metropolitan Clinical Taskforce (GMCT).

The guidelines were developed in response to anecdotal evidence that junior medical staff had limited skills to manage eye emergencies and that there was a paucity of education to assist remedy this. Consequently the EEM was designed to assist non-ophthalmic clinicians to manage eye emergencies, particularly in Emergency Departments (EDs) without an ophthalmic presence.

In order to encourage clinician use it was agreed to introduce the manual into EDs with a process to evaluate its effectiveness in improving care for patients who present with eye problems.

The Clinical Excellence Commission (CEC) and the SOS commenced the project as a collaborative effort using a modified clinical practice improvement framework. This methodology was successfully used by the CEC to implement twelve paediatric clinical practice guidelines into 53 NSW hospital emergency departments over a two-year period.

Twelve months funding of \$110000 was successfully sought from the SOS and GMCT.

2.2 Project Aims

The Eye Emergency Manual project aims:

- To encourage clinician use of the EEM
- To improve the assessment and management of patients presenting to EDs with eye problems
- To evaluate the effectiveness of the EEM in improving patient care for patients presenting to EDs with eye problems

3 METHODOLOGY

3.1 Project Structure

A Steering Committee was established to oversee the project and report on the status of the project to the SOS Governing Body on a quarterly basis. Membership comprised representatives from the NSW SOS, PHSS & NSC, CEC, NSW College of Emergency Medicine, NSW College of Emergency Nursing, Institute of Trauma and Injury Management (ITIM), Institute of Trauma Education and Clinical Standards (ITECS), a consumer and NSW Health.

A Project Officer was recruited by the NSW SOS to work with the Project Steering Committee, the CEC and the Executive Director of the SOS. The responsibilities of the role included coordinating participating sites, setting up multidisciplinary teams, organising project methodology education in liaison with the CEC, organising and contributing to interactive ophthalmic education and communicating with site team leaders. As well education was provided for audit form completion and oversight of the audit of medical records pre and post introduction of the manual was undertaken.

3.2 Site Selection

In December 2006, expressions of interest were sought from Area Health Service (AHS) Chief Executives for participation in the project with an initial eight hospitals agreeing to participate.

Commencement of the project was delayed with the resignation of the first project officer and recruitment of a second project officer. Consequently in November 2007 expressions of interest were again sought from AHS Chief Executives. A further eighteen sites agreed to participate. Initially there were 26 participating sites. Appendix 1 provides a list of sites and their designation.

The project was aimed at sites without an ophthalmic presence. Principal Referral Group A sites (Teaching Hospitals) may have an ophthalmic presence which includes an ophthalmology department and trainee

ophthalmologists. Principal Referral Group B sites involved in the project did not have an on-site ophthalmic presence i.e. Nepean and Wollongong Hospitals. 21% of all sites had an ophthalmic presence (Table 1)

Table 1: Hospital Peer Groups¹

	All sites	
11	Major Metropolitan	46%
1	Major Non Metropolitan	4%
5	Principal Referral Group A	21%
2	Principal Referral Group B	8%
2	District Group 1	8%
2	District Group 2	8%
1	Sub Acute	4%

3.3 Site project teams

The Institute of Trauma and Injury Management (ITIM) Trauma Coordinators, ED Clinical Nurse Consultants (CNC) and Clinical Nurse Educators (CNE) at participating sites were contacted for assistance in setting up local multidisciplinary teams. Teams included nursing and medical clinicians as they were available.

3.4 Clinical Practice Improvement Methodology

'In any setting successful and sustainable change is linked to a framework or methodology that is consistently applied. Clinical Practice Improvement (CPI) is one model used to improve processes of care and service delivery². The CPI steps as outlined by the CEC in the Children's Emergency Care Project (CECP) Implementation and Education Toolkit² are noted below.

- Identification (diagnosis) of a problem
- Measurement of the scope and size of the problem
- Identification of interventions that might reduce the problem
- Implementation of the intervention
- Re-measurement to ascertain whether the intervention has been successful

As well in order to make effective changes in clinical practice there are three questions which must be answered:

- What are we trying to achieve?
- What change can we make that will result in an improvement?
- How will we know the change has resulted in an improvement?

Once these questions have been answered there are four steps to implementing the change known as the **PDSA** cycle:

- **Plan** – the change
- **Do** – conduct the test of the change
- **Study** – evaluate the impact of the change
- **Act** – implement changes which were effective or select new changes to test.

Each site was given a copy of: *Easy Guide to Clinical Practice Improvement, a Guide for Healthcare Professionals*, NSW Department of Health, Second Edition, 2002. This publication provides an overview of the CPI methodology has examples of quality improvement tools and techniques and provides advice on selection of appropriate improvement tools.

¹ Peer Groups as identified by NSW Health, Flowinfo Version 9.3

² Children's Emergency Care Project, Implementation and Education Toolkit, P15 Chapter 3, Clinical Excellence Commission

The first eight sites recruited to the project participated in a one day CPI workshop run by the CEC. The remaining sites were introduced to the CPI methodology by the project manager during site visits with principles reinforced as sites reviewed their processes for emergency eye care.

3.5 Audit Tool Development

Medical Record (MR) audit was used to evaluate any changes in the care following the introduction of the clinical guidelines in the EEM. Documentation was used as a surrogate for care given – *if it wasn't documented then it was assumed that care was not given.*

MR Audit was undertaken prior to commencement of the project to provide a preliminary, base line audit, and is referred to throughout this report as Audit 1. It was completed by each team for patients presenting prior to December 2006³. Medical records were audited again at two monthly intervals to demonstrate any changes in clinical practice. Each audit was completed by examining the MR of 20 randomly selected patients who had presented to a site emergency department with an eye emergency.

An audit tool V#3 (Appendix 2) was developed by the project officer and clinicians from the relevant SOS committees. It is set out in five distinct sections:

- Designation of treating clinician, age range, triage, auditor's triage, representation and diagnosis
- History and symptoms
- Examination
- Emergency Department Management
- Separation and follow up

The EEM provides recommendations for the triage category to be assigned to a particular diagnosis. The EEM recommendations have been based upon the Australasian Triage Scale (ATS)⁴. It is a hospital registration requirement, that all patients who present to be seen in an ED are given a triage category or ATS level.

Auditors were ED clinicians. The project officer taught each team correct use of the audit tool and provided a guide for completion of the tool to ensure consistency of completion.

Following commencement of the project, site teams suggested several changes to the audit criteria (Appendix 3). Consequently there were three versions of the audit tool Version #1 (V#1), Version #2 (V#2) with Version #3 (V#3) the final tool following feedback from project site teams. The use of different versions of the audit tool by the sites as they commenced the project is summarized below

Table 2: Use of different audit tools by sites

Audit tool -Version	Audit Tool V#1	Audit Tool V#2	Audit Tool V# 3
First 8 sites to commence	1	2	3, 4, 5
Next 16 sites to commence			1, 2, 3, 4

Completed audit tools were forwarded to the project officer and then scanned into a database using Teleform technology purchased for the project. Hard copies of the audit tool were allocated a unique number for identification purposes once scanned into the database.

Audits 2, 3, 4 and 5 where undertaken were completed over the months of the project to the end of October 2008.

An objective of the study was to identify statistically significant trends in the documentation of specific aspects of the history, examination and management of all types of eye emergencies presenting in ED as audited in the course of the project. Data were analysed with the chi-square test for trend. A *P* value <0.05 was considered to be significant.

³ Balmain Hospital's GP unit was one of six sites to informally pilot the guidelines in the EEM during 2006; therefore their preliminary audit was for patients who presented prior to December 2005.

⁴ G24 Guidelines for the implementation of the Australasian Triage Scale in Emergency Departments. Revised 05 August 2005

3.6 Project resources

The EEM was routinely distributed to all AHS, hospitals and EDs following publication of the first edition in 2007. The University of Newcastle and University of Sydney responded to an offer of the manual and were provided with up to three years supply for medical students. The Institute of Medical Education and Training (IMET) distributed the manual to junior medical officers (JMO) assigned to their hospitals during 2007 and 2008 through the hospital JMO units.

As part of the project eye emergency education based upon the guidelines in the EEM was offered to medical and nursing clinicians in EDs. Education on the use of the Slit Lamp was provided.

3.6.1 Medical Education

Local ophthalmologists and ophthalmology registrars were contacted by the project officer and invited to provide on-site eye emergency and slit lamp education to ED clinicians. Ophthalmologists were provided with a power point presentation based on consensus guidelines in the EEM. It was developed by the SOS clinicians to assist with the preparation of emergency clinician education and to ensure standard education in line with the recommended guidelines contained within the EEM.

3.6.2 Nursing Education

The Eye Emergency Nurse Education project commenced in May 2008 and was implemented in parallel with the EEM project. It aims to:

- To develop a nurse education program based on the Eye Emergency Manual to improve the assessment and management of patients presenting to NSW Emergency Departments (ED) with eye problems
- To trial an eye emergency education program for rural and metropolitan nurses and primary health care workers
- To evaluate the program and report on it
- To deliver the program to additional sites & re-evaluate

Senior ophthalmic nurse clinicians from Sydney Hospital/Sydney Eye Hospital worked with the SOS to develop a series of education presentations based on the consensus guidelines in the EEM. These thirty minute presentations were designed to be presented to clinicians, medical and nursing, in an emergency department and can be used for continuing education sessions or self directed learning in short timeframes in busy EDs.

The complete series is entitled 'Eye Education for Emergency Clinicians' and comprises nine power point presentations (Table 3)

Table 3: Eye Emergency Clinician Education Presentations

1	OCULAR ANATOMY
2	EYE EXAMINATION
3	VISUAL ACUITY
4	TRIAGE
5	OCULAR TRAUMA
6	EYE SKILLS
7	RED EYE
8	PHARMACOLOGY
9	TRANSPORTING A PATIENT WITH EYE TRAUMA

Presentations 2-7 were available for use with this project.

As an adjunct to these education presentations, the SOS and Sydney Hospital/Sydney Eye Hospital presented one day 'Eye Emergency Clinician Education' workshops in rural and metropolitan hospitals. Workshop participants completed an evaluation form to rate their knowledge of eye emergency management and skills pre workshop and post workshop.

These workshops ran in the latter part of the project from May to November 2008 and ED clinicians at the EEM project sites were encouraged to attend them.

3.6.3 Train the Trainer Education

To further enhance the ophthalmology skills of ED nurses', five ED clinical nurse consultants were provided with a two and a half day education workshop designed to provide the skills and knowledge to provide education for ED clinicians in their area.

3.6.4 Slit Lamp Education

Project teams identified that lack of knowledge about the components and operation of a slit lamp impacted upon JMO confidence with eye examination. The SOS purchased 30 Slit Lamp Explorer⁵ CDs which provide an interactive presentation designed to familiarise clinicians with basic and advanced techniques of slit lamp ocular examination using a *Haag-Streit* Slit Lamp. The program has been down loaded onto computers in all participating EDs. Several sites have a loan system in place whereby JMOs are able to borrow the Slit Lamp Explorer CD to take home to view during their own time.

Troubleshooting slit lamp problems was identified by all sites as an issue. The project has provided all sites with a scanned copy of the Haag-Streit Slit Lamp 900BQ Instruction Manual. Whilst not all EDs have this particular make and model of slit lamp, the basic components and operating instructions for all slit lamps are similar. All teams were encouraged to contact the manufacturers to provide them with an instruction manual specific to their slit lamp.

3.7 Ophthalmologist Referral Survey

The project officer conducted a random telephone survey of twenty five ophthalmologists and ophthalmology registrars to identify the quality of referrals from emergency departments to ophthalmologists. Participants were asked twelve questions about several aspects of the referral information they had received from EDs. These included whether an accurate history and assessment were provided, whether visual acuity was recorded and whether a provisional diagnosis was included (Appendix 4).

⁵ 'Slit Lamp Explorer' Vote, Tamblyn and Sanderson, 2003, University of Otago Dunedin School of Medicine

4 Problems Identified and Solutions Applied

Specific resources applied to the project included a framework or methodology within which to work, a project officer to manage the project and clinician education and education materials about the management of eye emergencies.

Prior to the commencement of the project many ED clinicians were not aware of the consensus guidelines published in the EEM. It had been distributed to Directors of all NSW Emergency Departments however in many instances it had not been forwarded to clinical areas.

4.1 Clinical Practice Improvement

Most teams struggled with the application of CPI methodology. All teams expressed an understanding of the methodology but stated they did not have the time to apply it in any formal way. All teams cited discussion amongst team members and observation of patient flow and work practices to identify problems. Only one team, the Balmain GP unit, applied the methodology consistently. This group was engaged in a CPI methodology training course provided by Sydney South West AHS, and they used the EEM project as their CPI project.

The first eight sites to commence the project attended a workshop which provided education on the CPI methodology and its application. This group and the sites which joined later received on site modified CPI methodology education as well as encouragement from the project officer to apply the methodology to their local situation. Each site project team was visited at least twice by the project officer.

Observation of the patient journey did identify practices that were inefficient such as the use of the slit lamp and poorly functioning eye examination areas.

Problems identified and solutions applied are outlined below.

4.1.1 Slit Lamp

All project sites have a slit lamp. A range of problems were identified including:

- variable clinician knowledge of slit lamp use
- eight of the 18 teams who completed the project identified problems with their slit lamp
- failure to switch off the slit lamp after use leading to globe failure was common
- all teams had the slit lamp checked annually by the hospital biomedical team however none of the team members were able to identify a service schedule by an authorised slit lamp technician for their slit lamp
- one team believed they required a new slit lamp when informed by biomedical engineering that the slit lamp was irreparable -they had it checked by an authorised slit lamp technician and were informed that their slit lamp was in perfectly sound condition and only required one new lens

Access to slit lamp was difficult for three teams:

- Sutherland Hospital: The slit lamp is located in the ED Eye Room. Problems identified were:
 - The slit lamp was situated behind the door, requiring the treating clinician to squeeze in behind the lamp
 - There was no chair specifically allocated for the patient and clinicians were often required to bring a chair into the room
 - The project team examined the lay out of the eye room and found several obstacles to efficient management of eye emergencies. The slit lamp has been moved so it can be easily accessed, by both clinician and patient, and a new adjustable chair has been purchased for the Eye Room
 - Prior to the project, the Sutherland Hospital ED had identified that clinicians not familiar with the operation of a slit lamp may leave the lamp switched on, causing the bulb to blow. To overcome this problem they installed an automatic timer over the on/off switch of the slit lamp and so it automatically switches off after 5 minutes, unless pressed again.

- Singleton Hospital: the slit lamp was situated next to a bed in the ED which is used as an examination bed for emergency patients as well as a recovery bed for patients who have had an anaesthetic. This bed is therefore often occupied with access to the slit lamp impeded. The Singleton team identified this and rectified the problem by having hospital maintenance apply lockable wheels to the slit lamp. The slit lamp is now always accessible to clinicians for eye examination.
- Ryde Hospital: the ED was undergoing renovations of the area that previously housed the slit lamp. The renovation plans included a specific room to be used as an Eye Room which would need to include an examination bed. The Ryde project team identified the need to set up a temporary eye examination area and the opportunity to ensure that the new Eye Room was well designed to ensure efficient management of eye emergencies. They identified an area in the ED that was being used to store bulky equipment, relocated the bulky equipment, had an electrician install a power source, moved the slit lamp to this area, attached a visual acuity chart to an existing cupboard, marked the floor at six metres from the visual acuity chart and collected the necessary eye equipment which are stored in the cupboard next to the slit lamp. All medications, including refrigerated drugs, are kept in a locked room which is several metres away from the eye examination area.

St George's project team leader designed and produced a poster, based upon the information given in the EEM (pages 17-18) which demonstrates basic slit lamp use.

A copy of a Slit Lamp Manual is included in papers for all participants of Eye Emergency Clinician Education Workshops.

4.1.2 Eye Examination Area Set up

Two sites, Ryde and Sutherland Hospitals identified major lay out and access issues with their eye room (Section 4.1.1). Both have addressed the issues and now have efficient eye examination areas.

Ryde Hospital's temporary eye examination area was found to be functional for both the patient and the examining clinician. It has become the permanent eye examination area freeing up the space allocated for an Eye Room in their renovation plans for other emergency patients.

The dedicated eye room in Sutherland Hospital ED is accessible and functional for both clinician and patient with updated equipment (Section 4.1.1).

All project sites now have an efficient eye examination area with essential examination equipment available and regularly checked. Many sites have used their eye examination area to display eye posters, management algorithms and templates based on the EEM for clinicians and general public information.

4.1.3 Visual Acuity testing

Testing of visual acuity was poorly set up in many sites. Problems identified include:

- 28% of the project sites needed to ensure floor markings at the correct distance from visual acuity testing chart. Several teams reported that their ED clinicians were not aware of the significance of distance markings, and sites also reported that the distance markings were repeatedly being cleaned off by hospital cleaning services
- Across all project sites there was a general lack of knowledge about the requirements for visual acuity testing.
- Two sites were using visual acuity charts that had been down loaded from the internet and printed onto A4 sized paper, both these sites explained that previous eye charts had 'gone missing' from their ED
- Those sites with light boxes did not know the correct number and wattage of bulbs in their light box. Only one team was able to identify the location of spare light globes.

Improvements included:

- Permanent marks on the wall or floor identified the correct testing distance from the visual acuity chart
- Several sites repositioned their visual acuity charts to where they would not be obstructed by other pieces of ED equipment.

- One site purchased an 'illiterate E' eye chart to enable the visual acuity testing of culturally and linguistically diverse patients.
- Blacktown, Canterbury, Manly, Mona Vale, Singleton, Tamworth, St George, and Westmead hospitals have introduced visual acuity testing as a competency for triage, clinical initiatives and advanced practice nurses.
- Ryde, St Vincent's and John Hunter Hospital EDs plan to include visual acuity testing as a competency.

4.1.4 pH testing

All teams prior to the project were testing the pH of tears with urinalysis testing strips cut down to the pH section of strip. This is time consuming and potentially leaves sharp edges on the strip which could further damage a cornea that is already injured from a chemical burn.

Whilst the use of pH testing paper to identify the pH of tears with a chemical burn is debatable⁶ the pH of a chemically injured eye is often requested by the attending ophthalmologist. The project has recommended the pH testing paper used by clinicians at the Sydney Hospital/Sydney Eye Hospital as more appropriate than urinalysis strips. This testing paper is a strip that is moistened with tears and read against the colour codes on its container. All project sites have purchased the pH testing paper recommended by the project.

4.1.5 Pain relief for patients

The use of analgesia and local anaesthetic drops were considered.

56 % of project sites identified the problem of eye patients having to wait in pain to see a doctor. For example patients presenting to EDs with flash burns from welding or UV exposure or chemical burns commonly describe a great deal of pain. Until pain is managed patients are often unable to provide a clear history or to focus on instructions. Early administration of pain relief ensures that the patient can be reassured and made more comfortable within minutes of arrival at triage.

The solution to the problem was the implementation of standing orders for nurse administration of analgesia and local anaesthetic for flash burns and chemical burns.

Standing orders for patient analgesia were in place in all sites. It was noted that most project sites did not have nurse standing orders for the administration of local anaesthetic for eye conditions.

A flash burn is a relatively minor eye injury and once pain is controlled it is acceptable for a patient with a flash burn to wait whilst more serious conditions are dealt with the ED. Without standing orders, the patient is required to wait until the nurse finds a medical officer to prescribe the local anaesthetic prior to administering the drug. With standing orders, the nurse administers the drug, writes up the medication as per the standing orders on the patient's medication order form then has a medical officer sign for the drug that was given.

Only one project site, John Hunter Hospital, was actively using standing orders for the administration of local anaesthetic for eye conditions prior to commencing on the project. Several sites had standing orders approved but the project team were not aware of this until they applied for standing orders to improve their patient care.

Belmont, John Hunter, Manly Mona Vale, Singleton Tamworth, Blacktown, Nepean and St George hospitals have implemented standing orders for local anaesthetic for eye conditions. Following completion of the project Ryde Hospital gained approval for and has implemented standing orders.

4.1.6 Triage Category 2 Patient Flow - Eye Emergencies

The guidelines in the first edition of the Eye Emergency Manual which was introduced with this project assigned the Australasian Triage Scale (ATS) category 2 to one common eye emergency i.e. chemical burns of the eye/s. In relation to common eye emergencies the ATS category reflects the potential of a vision threatening condition not haemo-dynamic stability or pain intensity which may require a higher score.

It was identified that patient flow through the ED was not clear when the patient has an ATS category 2, eye emergency. Common to all project site EDs these ATS category 2 patients are not seen in the resuscitation

⁶ Mardsen, J(2006) 'The care of patients presenting with acute problems in ophthalmic care' Wiley Chichester

area. In some instances there was no known process for communicating where the category 2 patient with a chemical burn to the eye/s was being treated eg in the eye room.

Sites set about providing a solution to this problem. For example one site decided to utilise one of three resuscitation beds for patients with chemical burns to the eye/s. Each resuscitation bed has an irrigation kit, containing one litre of normal saline, a giving set and pH testing paper, in a bin attached to the wall behind the resuscitation bed

Blacktown Hospital's senior ED medical and nursing clinicians developed a flow chart to inform all staff of their responsibilities when a category 2 eye patient presents. Chemical burns to the eye/s are treated in the Eye Room. Significant trauma patients are seen in the resuscitation area, which includes penetrating eye injuries and suspected fractured orbit.

4.1.7 Irrigation

50% of sites identified the lack of a standard irrigation procedure for chemical burns as a problem. Most sites addressed this lack with the development of a Standard Operating Procedure (SOP) for eye irrigation. Canterbury Hospital developed a Policy and Procedure for eye irrigation whilst Blacktown/Mt Druitt developed a Tool Kit for eye trauma/ chemical burn.

Canterbury Hospital provided leadership to address this problem by researching the literature with Nepean Hospital developing the first draft SOP and St Vincent's Hospital building on their initial efforts. Ophthalmic nurse specialists at Sydney Hospital/Sydney Eye Hospital provided feedback on the SOP as it was developed. The final SOP was provided to all sites. It is unclear whether all sites implemented the SOP however those who did, educated clinicians and made it available on ED computers and in the Eye Room.

4.1.8 Triage categories

Project teams identified the need for changes to the triage category recommended for three of the eye emergency conditions in the manual.

Table 4: Recommended Changes to Triage Categories

EYE EMERGENCY	EXISTING ATS CATEGORY	RECOMMENDED ATS CATEGORY
LID LACERATION	4	2
SHARP PENETRATING TRAUMA	3	2
BLUNT TRAUMA – RUPTURED GLOBE	3	2

Rationale for change included:

- A full thickness lid laceration is a potential penetrating eye injury until proven otherwise and delay in commencing treatment for a penetrating eye injury increases the risk of sight threatening complications. It is therefore a triage category 2.
- Blunt trauma is a broad classification that is distinguished by the mechanism of injury i.e. blunt not sharp. The injury may be relatively minor or potentially sight threatening depending upon the mechanism of injury. Clinicians agreed that blunt trauma would usually warrant a triage category 3 but a ruptured globe would be given a triage category 2 as this is a sight threatening injury,

4.2 Documentation

It was identified early in the project during medical record audit that documentation of eye assessment and management was poor.

In an attempt to solve this problem the Belmont and John Hunter Hospital teams developed the *Eye Emergency Assessment Form* (Appendix 5) with project assistance and review and feedback from project participating sites.

Ten project sites, across four Area Health Services trialled the assessment form. All teams using the form were encouraged to implement it using the systematic approach of informing ED clinicians when the form would be implemented, providing clinicians with education about the use of the form and ensuring the form is available for clinicians to use.

Sites which have moved to the Electronic Medical Records (EMR) use the *Eye Emergency Assessment Form* as a documentation guide for clinicians.

The form has been submitted for inclusion in the next update of FirstNet⁷ in SWAHS.

Following implementation several teams counted the number of *Eye Emergency Assessment Forms* in the medical records which they audited for audits #4 and #5. This showed minimal use of the assessment form.

4.3 Education

Education based on the EEM was provided to enhance the ophthalmic skills of medical and nursing clinicians in ED.

4.3.1 Emergency Department Clinician Education

The resources developed by the EEM Nurse Education Project which was running in parallel to this project were used to educate ED clinicians, medical and nursing, involved in the introduction of the EEM. The presentations on CDs (Section 3.6.2) were originally designed for nurses however the content was suitable for ED clinicians; medical and nursing in a variety of roles e.g. registered nurses, nurse practitioners, JMOs, CMOs and ED registrars.

300 CDs were produced containing six thirty minute presentations for Eye Education for Emergency Clinicians. These have been distributed to medical and nursing clinicians throughout NSW, via the education workshops. Participants were provided with a copy of the EEM which had the CD in an adhesive sleeve inside the front cover.

These presentations were downloaded onto the desktop of computers used for education in all project sites.

The final, completed presentations will be available on the GMCT web site to increase accessibility to this eye emergency education resource.

Thirteen Eye Emergency Clinician Education workshops have been held between 13th May 2008 and 26th November 2008, providing eye emergency education for 201 ED clinicians during the project.

4.3.2 Medical Education

Education by a local ophthalmologist /ophthalmology registrar was arranged by the project officer for seventeen project sites (3.6.1). The project officer was unable to arrange ophthalmologist education for clinicians in the emergency departments of Blacktown, Auburn and Mt Druitt Hospitals. Overwhelmingly, ophthalmologists contacted were helpful either by providing the education themselves or by giving the contact details for a colleague who may be able to help.

Seven of the project sites have included eye emergency education into their routine orientation of junior medical clinicians to their ED.

St George Hospital ED project team enhanced medical education by including questions on eye emergencies in their ED Fellowship Candidate spot diagnosis and management quiz. They have also planned short term secondments to Sydney Hospital /Sydney Eye Hospital ED and Eye Clinic for advanced ED trainees to enhance practical ophthalmology skills.

4.3.3 Train the Trainer Education

Five nursing clinicians have been given additional ophthalmic training so they can provide education for ED nurses in their AHS (3.6.3).

To date the trainers have used their skills to undertake a variety of training including:

- A one day workshop in Lismore, supported by a Sydney Hospital/ Sydney Eye Hospital CNC
- A skills station workshop for Manly/Mona Vale ED clinicians. The skills stations cover chemical burns and eye irrigation; visual acuity testing; eye examination and slit lamp basics. Each station will have an educator or CNC providing the education.
- Education on triage and eye history, via videoconferencing and web streaming to eleven rural sites.

⁷ Firstnet is a module of the Cerner Patient Administration System (PAS) and is replacing the Emergency Department Information System (EDIS)

- The ocular trauma education module has been presented twice for the ED clinicians in Nepean hospital's ED and once in the Blue Mountains' hospital ED with plans to continue to use the modules in education sessions for Lithgow, Blue Mountains and Nepean Hospitals next year.
- One CNC/ lecturer at the University of Sydney from emergency services at Westmead Hospital used her knowledge to influence the emergency nursing curriculum and contents of the courses with which she is involved. Eye emergencies have been included in the curriculum for the Graduate Certificate in Nursing with a one hour face to face lecture on eye emergencies. Eye emergencies have also been included in the following emergency nurse courses: Introduction to emergency nursing, Triage and Clinical Initiative Nurse Program. There are also plans to provide an on site information session on how the slit lamp works.

4.3.4 Slit Lamp education

Slit Lamp Explorer CDs have been given to a total of twenty four emergency departments (3.6.4). All sites with the CD have reported that they have provided access to the CD and encouraged its use by all JMOs rotating through the department.

The *Slit Lamp Explorer* requires internet access and users have reported that it is time consuming to view which has limited its potential to provide on-site emergency department education for JMOs. Clinicians who have used the program reported that they would like a program that compares normal and abnormal examples for each of the common eye conditions under a slit lamp examination.

4.4 Results of Ophthalmologist Referral Survey

The Ophthalmologist Referral Survey provided information about the quality of the referrals received by local ophthalmologists.

72% ophthalmologists surveyed rated the quality of referrals from emergency departments as good or very good.

There were several aspects of history, assessment, treatment and diagnosis which were not well documented in referral letters. 68% of ophthalmologists reported that they did not receive an accurate eye history, 48% reported not receiving an accurate description of the affected eye and 52% reported not receiving documentation of all treatment commenced in ED. A correct provisional diagnosis was received by 56% of ophthalmologists.

Comments by ophthalmologists can be summarized as follows:

- Review by senior ED medical staff prior to referral is required
- Medical education about eyes is required early in ED rotation
- Better documentation of the presenting problem was required
- Need to supply referring doctor's provider number when referring to external ophthalmologists
- Need a system for ED/ Ophthalmologist communication in both directions

5 Audit Results

5.1 Data Sets

26 original sites were reduced to 24 when one ED completed one audit, decided that they did not need to devote resources to improving eye emergency management and withdrew from the project. A second site was unable to complete the audits, or apply the methodology and was also excluded.

Of these 24 participating sites eight sites commenced six months earlier than the remaining 16 sites, completed an additional audit and made changes to the audit tool.

Project sites have been divided into two groups, Group A which participated fully in the project and applied the modified CPI methodology and Group B which did not (Table 5). Subgroups A2 and B2 consists of the initial eight participating sites.

Both groups completed the audit requirements.

Table 5: Overview of Groups by data set and audit tool version

GROUP	SITES BY DATA SET	DESCRIPTION OF DATA SET	AUDIT TOOL V#1	AUDIT TOOL V#2	AUDIT TOOL V# 3
A	A1 (11)	AUDIT #5 EXCLUDED			1, 2, 3, 4
	A2 (7)	5 AUDITS COMPLETED	1	2	3, 4, 5
B	B1 (5)	AUDIT #5 EXCLUDED			1, 2, 3, 4
	B2 (1)	5 AUDITS COMPLETED	1	2	3, 4, 5

Complexity was introduced with changes to the audit tool and so to manage the complexity two data sets were defined.

Data Set #1 (Core): The core data set excludes Audit #5 (a total of 161 records as one site completed an additional audit tool) and comprises the Audits 1- 4 for Groups A and B with the exception of five 'removed' fields and nine added fields i.e. fourteen fields were added, changed or removed for Audit Tool V#2. The fields removed were seen as unnecessary or repetitive:

- *Auditors' Triage Category* was misinterpreted, poorly completed and is not reported upon
- Of the nine fields changed/added for V#2 four were changed again for V#3. Data from these four fields i.e. *seen by, contact lens, fundus examination and neurological examination* have been recoded for consistency of reporting from audits 2 and 3. *Contact lens* was poorly completed and not reported.
- Of the remaining five fields *hospital re-presentation* was poorly completed and not reported.

Data Set # 2 (a subset of the core data set): excludes the first audit undertaken using V#1 of the audit tool by groups A2 and B2 (Table 5) which comprises 165 audits as sites completed an additional 5 audits. It will be used to report results of the fields added in V#2 of the audit tool, that is *seen by, slit lamp, instillation of local anaesthetics, urgent ophthalmology consultation – method of contact, and time of irrigation commenced* (the last two fields were poorly completed and not reported).

The total number of MR audits completed was 2058. **Data Set #1** comprises the total records less the fifth audit which totals **1897** (Table 6). **Data Set #2** therefore comprises **1732** records i.e. Data Set #1 less 165. (Table 6)

Appendix 3 provides a summary of audit tool changes by criteria and audit version.

The second and third aims of the project were to improve the assessment and management of patients attending ED with an eye problem and to evaluate the effectiveness of the EEM in doing this. Therefore statistically significant trends in documentation of specific aspects of the history, examination and management of all types of eye emergencies presenting to ED as audited in the course of the project need to be identified. Data were analysed with the chi-square test for trend. A *P* value <0.05 was considered to be significant. Audits where no diagnosis was recorded were excluded.

Table 6: Audit count by dataset

Dataset	No. of Observations (Audits)		% Total
Total	2058		
Less Audit #5 – A2		141	
Less Audit #5 – B2		20	
	161		7.8%
Data Set #1 (excluding Audit #5)	1897		92.2%
Less Audit #1 – A2		144	
Less Audit #1 – B2		21	
	165		
Data Set #2 (excluding Audit #5 and Audit #1 for Group A2 & B2)	1732		84.16%

5.2 Diagnosis Groupings

Recorded provisional diagnoses or presenting symptoms were grouped based upon the algorithms detailed in the EEM. Under the broad classifications of *Trauma* (T), *Acute Red Eye* (ARE) and *Acute Visual Disturbance* (AVD) sixteen diagnostic groupings were developed (Table 7). For the purposes of reporting two diagnostic groups have been combined i.e. *Trauma: corneal foreign body* and *Trauma: foreign body not corneal* results become '*Trauma: foreign body*'.

Table 7: Diagnosis Groupings

Dx Code	Diagnostic Groups	Dx Code	Diagnostic Groups
1	Acute red eye (ARE): painful	9	T: blunt
2	ARE: painful, cornea abnormal	10	T: sharp penetrating
3	ARE: painful, conjunctival injection	11	T: other
4	ARE: painful, eye lid abnormal	12	Other
5	ARE: painless, localised	13	Not recorded
6	Trauma (T): chemical burn	14	Acute Visual Disturbance
7	T: corneal foreign body	15	T: foreign body not corneal
8	T: lid laceration	16	T: burns, not chemical

Appendix 6 provides examples of the diagnoses recorded and how they were grouped.

5.3 Audit Results – Data set #1

The data set #1 (1897records) is used to report results for the audit tool data items in this section.

5.3.1 Age range

Patients between 14 – 65+ years of age comprised 81% of the eye emergency records audited. Just over 13% of patients were children up to and including 13 years of age.

Table 8: Age range of patients seen

AGE RANGE (YEARS)	FREQ.	%
0 - 4	140	7.38
5 - 13	111	5.85
14 - 64	1370	72.22
65 + OVER	157	8.28
UNKNOWN	119	6.27

5.3.2 Provisional Diagnosis/ Presenting Symptom

Three distinct diagnosis groupings make up 56% of the eye emergency work audited in EDs i.e. *T: foreign body*, *ARE: painful diffuse conjunctival injection/conjunctivitis*, and *ARE: painful, cornea abnormal*. 4 % of eye emergency caseload is *T: chemical burn* of the eye/s. 10% of records did not have a diagnosis or presenting problem recorded (Table 9) and were excluded.

Table 9: Frequency of ED Presentation by diagnosis

Diagnosis Grouping	Freq.	%
T: foreign body	462	24.35
ARE: painful, diffuse conjunctival injection	370	19.5
ARE: painful, cornea abnormal	230	12.12
ARE: painful, eyelid abnormal	112	5.9
ARE: painful	104	5.48
T: blunt	79	4.16
T: chemical burn	77	4.06
Acute Visual Disturbance	56	2.95
T: burns, not chemical	54	2.85
T: other	48	2.53
T: lid laceration	15	0.79
ARE: painless, localised	11	0.58
T: sharp penetrating	5	0.26
Not recorded	191	10.07
Other	83	4.38

Results for a range of audit tool fields will be reported for these four specific diagnoses i.e. top three most frequent presentations and chemical burn of the eye/s.

5.3.2.1 Triage and Diagnosis

Triage category was not recorded in 1.74% of audits (33 records) in data set #1.

The table below shows the ATS category given for the specific diagnoses against the recommended ATS category in the EEM for the diagnostic group.

Table 10: Appropriateness of Triage Categories applied to four designated diagnoses

Triage 4 Specific Dx		1	2	3	4	5	Total
T: Foreign Body (ATS 4)	f		8	118	254	72	452
% Total Recorded by ATS			1.77	26.11	56.19	15.93	100
ARE: painful diffuse conjunctival injection (ATS 5)	f	1	11	75	194	83	364
% Total Recorded by ATS		0.27	3.02	20.60	53.30	22.80	100.00
ARE: painful cornea abnormal (ATS 4)	f	1	18	67	106	36	228
% Total Recorded by ATS		0.44	7.89	29.39	46.49	15.79	100.00
T: chemical burns	f	1	20	34	16	5	76
% Total Recorded by ATS		1.32	26.32	44.74	21.05	6.58	100.00

These results show that:

- 56% of the patients audited with a diagnosis of *T: foreign body*, were given the recommended ATS category of 4. When not given the recommended ATS category, these patients were more likely to be triaged higher.
- 77% of *ARE: painful, diffuse conjunctival injection* patients triaged higher than the recommended ATS category of 5.
- 46% of *ARE: painful, cornea abnormal* patients were triaged at the recommended ATS category of 4 whilst 38% were triaged higher.
- It was noted that 72% percent of patients presenting with *T: chemical burns* were given an ATS category lower than the recommended ATS category of 2.

5.3.2.2 Triage, and Age by Diagnosis

The relationship between age and ATS category for the four specific diagnoses was considered (Appendix 7). Records without age and/or ATS category recorded were excluded. It was found that:

- 87% of patients attending project participating EDs with the four specific diagnoses are aged between 14 – 65+ years.
- There was the greatest representation of children aged between 0 – 13 years for *ARE: painful, diffuse conjunctival Injection* (24%).

A break down by diagnosis and age, of those diagnoses triaged higher and lower than recommended is provided in Table 11 below.

Table 11: Application of recommended triage category by age and diagnosis

Age by Dx	Freq of Rec ATS	% total for age range	Freq of higher ATS	% total for age range	Freq of Lower ATS	% total for age range
T: FB (ATS 4)						
0-13yrs	8	38.10%	8	38.10%	5	23.81%
14-65 +yrs	230	56.93%	111	27.48%	63	15.59%
ARE: Painful conjunctival Injection (ATS 5)						
0-13yrs	25	30.49%	57	69.51%		
14-65 +yrs	53	20.08%	211	79.92%		
ARE: Painful cornea abnormal (ATS 4)						
0-13yrs	10	41.67%	11	45.83%	3	12.50%
14-65 +yrs	92	46.70%	74	37.56%	31	15.74%
T: Chemical Burn (ATS 2)						
0-13yrs	0	0.00%	0	0.00%	7	100.00%
14-65 +yrs	17	27.42%	1	1.61%	44	70.97%

- For the three most common diagnoses the majority of children and adults were triaged at the recommended ATS category or higher
- All children and 71% of adult patients presenting with *T: chemical burn* were triaged to a lower ATS category

5.3.3 History

Four symptoms routinely collected when taking a history for all eye presentations i.e. red eye, painful eye, visual disturbance and affected eye are data fields in the audit tool. These symptoms are reported across audits to identify any change in documentation. The data are presented in the tables below for all diagnoses and those specified diagnoses some with additional specific history data items (Tables 12 – 16).

The documented item could be a ‘yes’ or ‘no’ to an aspect of history, examination or management and so can’t be used to indicate that a particular aspect has occurred. The percentage documented of aspects of history are noted as well as any statistically significant improving/ rising trends in the documentation over the project.

5.3.3.1 Symptoms for All Diagnosis Groupings

Table 12: Percentage documented (%D) of aspects of history – All Diagnoses

Audit No.	1		2		3		4		Totals	
History	No	%D	No	%D	No	%D	No	%D	No	%D
Red Eye	310	67.69	321	68.74	308	65.81	355	78.54	1294	70.14
Eye Pain	368	79.14	341	72.71	355	76.18	369	81.1	1433	77.25
Visual Disturbance	130	38.46	150	43.99	187	52.53	191	58.23	658	48.28
Affected Eye	352	76.19	365	79.52	420	89.36	332	73.61	1469	79.75

Documentation of *red eye* was 70% and there has been a statistically significant improving trend ($P=0.0022$) in recording across audits.

Eye Pain and *affected eye* were documented frequently, at 77% and 80% respectively. There was no statistically significant improvement in the documentation of either of these symptoms.

Visual disturbance was documented at 48% however it does show a statistically improving trend ($P<0.0001$).

5.3.3.2 Symptoms by Specified Diagnoses

T: FOREIGN BODY

Table 13: Percentage documented (%D) of aspects of history in audits with a diagnosis of T: foreign body

Audit No.	1		2		3		4		Totals	
History	No	%D	No	%D	No	%D	No	%D	No	%D
Red Eye	74	66.67	81	70.43	69	62.16	95	81.90	319	70.42
Eye Pain	99	87.61	86	75.44	82	73.87	98	83.05	365	80.04
Visual Disturbance	31	28.97	48	43.24	58	52.25	65	56.03	202	45.39
Affected Eye	87	76.99	84	78.50	98	86.73	83	70.94	352	78.22
Mechanism of Injury	77	74.04	78	71.56	96	86.49	97	82.91	348	78.91
Time of Injury	48	45.71	61	57.55	91	81.98	76	67.86	276	63.59

Red Eye is documented on average at 70% and there has been statistically significant improvement in the recording of this symptom ($P=0.0469$).

Eye Pain and *affected eye* were documented well at 80% and 78% across audits. There was no statistically significant improvement in the documentation of either of these symptoms.

Visual disturbance was documented at 45% across audits however it does show a statistically improving trend ($P<0.0001$).

Mechanism of Injury and *Time of Injury* were documented well at 79% and 64% with both showing statistically significant improvement of $P=0.0173$ and $P<0.0001$ respectively.

ARE: PAINFUL DIFFUSE CONJUNCTIVAL INJECTION

Table 14: Percentage documented (%D) of aspects of history in audits with a diagnosis of ARE: painful, diffuse conjunctival injection

Audit No.	1		2		3		4		Totals	
History	No	%D	No	%D	No	%D	No	%D	No	%D
Red Eye	69	86.25	71	86.59	81	78.64	85	90.43	306	85.24
Eye Pain	50	64.10	56	67.47	73	69.52	73	78.49	252	70.19
Visual Disturbance	29	35.80	40	49.38	47	44.76	43	47.25	159	44.41
Affected Eye	56	70.89	68	81.93	94	89.52	75	78.95	293	80.94

Red Eye (85%) and *Affected Eye* (81%) were documented very well. The recording of neither symptom showed any statistically significant improving trends.

Eye pain documented at 70% did show a significant statistical improvement ($P=0.0399$)

Visual Disturbance was documented at less than 50% (44%) and there was no statistically significant improvement.

ARE: PAINFUL CORNEA ABNORMAL

Table 15: Percentage documented (%D) of aspects of history in audits with a diagnosis of ARE: painful, cornea abnormal

Audit No.	1		2		3		4		Totals	
History	No	%D	No	%D	No	%D	No	%D	No	%D
Red Eye	44	74.58	38	71.70	31	63.27	48	82.76	161	73.52
Eye Pain	55	84.62	50	89.29	41	85.42	56	96.55	202	88.99
Visual Disturbance	28	45.90	22	42.31	25	52.08	35	62.50	110	50.69
Affected Eye	48	75.00	50	90.91	43	89.58	46	82.14	187	83.86

Eye Pain, affected eye and red eye were documented at 89%, 84% and 74% respectively across audits. There was no statistically significant improvement in the documentation of any of these symptoms.

Visual disturbance is documented at 51% however it does show a statistically improving trend ($P < 0.0479$).

T: CHEMICAL BURN

Table 16: Percentage documented (%D) of aspects of history in audits with a diagnosis of T: chemical burn

Audit No.	1		2		3		4		Totals	
History	No	%D	No	%D	No	%D	No	%D	No	%D
Red Eye	15	75.00	11	78.57	13	54.17	15	88.24	54	72.00
Eye Pain	19	86.36	11	78.57	20	86.96	17	100.00	67	88.16
Visual Disturbance	7	33.33	7	50.00	13	54.17	13	76.47	40	52.63
Affected Eye	20	90.91	11	78.57	22	91.67	14	82.35	67	87.01
Mechanism of Injury	20	90.91	11	91.67	18	75.00	16	94.12	65	86.67
Time of Injury	11	52.38	10	83.33	14	58.33	16	94.12	51	68.92

Red Eye, eye pain, affected eye and mechanism of injury were all documented well and at more than 70% (Table 16) however there was no significant improvement in documentation over the four audits.

Visual Disturbance was documented at 53% across audits and showed statistically significant improvement in documentation ($P = 0.0106$). There was statistically significant improvement in the documentation of *Time of injury* ($P = 0.0360$) which was documented at 69%.

5.3.4 Examination

5.3.4.1 ALL DIAGNOSES

Table 17: Percentage documented (%D) of aspects of examination – All Diagnoses

Audit No	1		2		3		4		Totals	
Examination	No	%D	No	%D	No	%D	No	%D	No	%D
External eye / lids	202	44.01	236	52.21	269	57.85	253	55.6	960	52.43
Pupils	218	48.66	251	55.29	242	51.38	274	60.35	985	53.91
Fundus	101	23.17	75	16.89	110	24.28	111	24.67	397	22.27
Visual acuity	301	63.77	307	66.16	314	66.95	322	70.77	1244	66.88
Fluorescein	195	42.12	212	45.89	242	51.71	221	49.22	870	47.23
Neuro Exam	42	14.74	82	18.18	81	17.23	73	16.08	278	16.75

Data set #2 is used to identify the documentation of Slit Lamp use and is discussed in section 5.4.

The percentage documented for *fundus* examination for all diagnoses is 22% which means that 78% of audits did not have documentation. This low level of documentation for *fundus* examination is reflected in tables 18-21 for the specified diagnoses with statistically significant improvement in documentation for *T: Foreign Body* only.

Fluorescein is documented at 47% across audits. The average documentation of *fluorescein* varies across all four diagnoses in tables 18-21 and documentation showed a statistically significant improvement ($P=0.0088$).

Documentation of *neurological examination* is low at 17% and shows no significant trend in improvement across audits.

External eye/lids, *pupils* and *visual acuity* were all documented at more than 50% and were showing statistically significant improvement i.e. *External eye/lid* examination ($P = 0.0001$), *Pupil* examination ($P = 0.0031$) and *Visual acuity* ($P = 0.0262$).

5.3.4.2 Examination for Specified Diagnoses

T: FOREIGN BODY

Table 18: Percentage documented (%D) of aspects of examination with a diagnosis of *T: foreign body*

Audit No.	1		2		3		4		Totals	
Examination	No	%D	No	%D	No	%D	No	%D	No	%D
External eye/ lids	35	32.11	49	45	55	48.67	57	48.72	196	43.8
Pupils	44	42.72	50	46.3	49	42.98	66	56.41	209	47.3
Fundus	13	12.62	14	12.7	19	17.76	26	22.41	72	16.5
Visual acuity	70	62.5	81	73	81	72.97	84	71.19	316	69.9
Fluorescein	48	44.04	57	50.9	68	60.71	72	62.07	245	54.6

Statistically significant improving/rising trends were identified in the documentation of *External eye/lid* examination ($P = 0.0113$), *Fundus* examination ($P = 0.0285$) and *Fluorescein* ($P = 0.0025$).

External eye/lids and *pupils* were documented at less than 50% despite the statistically significant increase of *external eye/lid* across the audits.

The statistically significant improvement in the documentation of *fluorescein* is encouraging at 55%. This investigative tool is recommended in the guidelines in the Eye Emergency Manual (EEM) for the examination of foreign body.

ARE: PAINFUL DIFFUSE CONJUNCTIVAL INJECTION

Table 19: Percentage documented (%D) of aspects of examination in audits with a diagnosis of ARE: painful, diffuse conjunctival injection

Audit No.	1		2		3		4		Totals	
Examination	No	%D	No	%D	No	%D	No	%D	No	%D
External eye/ lids	46	56.79	46	55.4	69	67.65	58	61.05	219	60.66
Pupils	35	43.21	47	56.6	50	48.08	55	59.14	187	51.80
Fundus	21	26.58	12	14.8	20	19.8	20	21.98	73	20.74
Visual acuity	44	53.01	54	64.3	61	58.65	59	62.77	218	59.73
Fluorescein	27	32.93	38	44.7	34	33.01	31	33.33	130	35.81

There is no significant improving trend for any examination field for this diagnosis grouping. It is noted that documentation did not occur for *fundus* and *fluorescein* in approximately 80% and 64% of records respectively.

ARE: PAINFUL CORNEA ABNORMAL

Table 20: Percentage documented (%D) of aspects of examination in audits with a diagnosis of ARE: painful, cornea abnormal

Examination	No	%D	No	%D	No	%D	No	%D	No	%D
External eye / lids	26	41.27	26	51	19	40.43	24	42.11	95	43.58
Pupils	33	51.56	34	65.4	25	54.35	32	56.14	124	56.62
Fundus	18	28.13	7	14	7	14.58	11	19.3	43	19.63
Visual acuity	50	75.76	37	68.5	37	77.08	41	71.93	165	73.33
Fluorescein	38	58.46	35	66	35	72.92	40	70.18	148	66.37

66% of audited records had *fluorescein* documented. The guidelines in the EEM recommend the use of *fluorescein* to ascertain the extent of any epithelial defect. There is no significant improving trend for documentation of *fluorescein* or any other examination field for this diagnosis grouping.

T: CHEMICAL BURN

Table 21: Percentage documented (%D) of aspects of examination of audits with a diagnosis of T: chemical burn

Audit No.	1		2		3		4		Totals	
Examination	No	%D	No	%D	No	%D	No	%D	No	%D
External eye / lids	9	42.86	8	72.7	13	56.52	7	41.18	37	51.4
Pupils	12	57.14	8	66.7	15	62.5	9	52.94	44	59.5
Fundus	3	14.29	4	30.8	7	29.17	4	23.53	18	24
Visual acuity	16	72.73	10	71.4	13	54.17	14	82.35	53	68.8
Fluorescein	14	63.64	8	57.1	11	47.83	9	52.94	42	55.3

There is no significant improving trend in documentation for any examination field for this diagnosis grouping. Visual acuity was documented in 69% of audits.

5.3.5 Management

5.3.5.1 Analgesia

24% of records had documented use of analgesia. The Auditors were asked to look at medication charts and it is a requirement that all drugs given be recorded on the medication chart even if given as part of a standing order. If the patient was offered analgesia and refused the auditors would have recorded this as a 'yes'.

Table 22: Percentage documented (%D) of Analgesia – all diagnoses

Audit Number	1		2		3		4		Totals	
Management	No	%D	No	%D	No	%D	No	%D	No	%D
Analgesia	115	25.05	90	19.05	113	23.89	124	27.43	442	23.84

There is no statistically significant improving trend in documentation of this aspect of management across all diagnoses or for specific diagnoses in Tables 23 – 26.

T: FOREIGN BODY

Table 23: Percentage documented (%D) of aspects of management in audits with a diagnosis of T: foreign body

Audit No.	1		2		3		4		Totals	
	No	%D	No	%D	No	%D	No	%D	No	%D
Foreign body removal	66	60.55	79	69.30	79	69.91	72	62.61	296	65.63
Analgesics	24	22.43	21	18.42	21	18.42	28	23.93	94	20.80

66% of *foreign body* removal was documented however documentation of the use of analgesia was low at 21%. The guidelines in the EEM recommend oral analgesia as required.

ARE: PAINFUL DIFFUSE CONJUNCTIVAL INJECTION

Table 24: Percentage documented (%D) of aspect of management with a diagnosis of ARE: painful, diffuse conjunctival injection

Audit No.	1		2		3		4		Totals	
	No	%D	No	%D	No	%D	No	%D	No	%D
Analgesics	10	13.33	11	12.94	13	12.26	15	15.79	49	13.57

Documentation of analgesia was low at 14% across audits. The Eye Emergency Manual is silent on analgesia for this diagnosis grouping.

ARE: PAINFUL CORNEA ABNORMAL

Table 25: Percentage documented (%D) of aspects of management with a diagnosis of ARE: painful, cornea abnormal

Audit No.	1		2		3		4		Totals	
	No	%D	No	%D	No	%D	No	%D	No	%D
Analgesics	16	25.40	13	23.64	18	36.73	20	35.09	67	29.91

Analgesia was recorded for 30% of audits. The guidelines in the EEM recommend oral analgesia as required if the diagnosis is corneal foreign body or corneal abrasion.

Table 26: Percentage documented (%D) of aspects of management of audits with a diagnosis of T: chemical burn

Audit No.	1		2		3		4		Totals	
	No	%D	No	%D	No	%D	No	%D	No	%D
Urgent consultation	6	28.57	3	21.43	7	31.82	6	35.29	22	29.73
Irrigation	14	66.67	10	71.43	21	87.50	14	82.35	59	77.63
Analgesics	8	36.36	4	30.77	8	33.33	4	23.53	24	31.58

The guidelines in the EEM recommend that an urgent referral to an ophthalmologist is required within 24 hours. Only 30% of *urgent consultation* was documented.

Irrigation was well documented at 78% across audits. The guidelines in the EEM are silent on *analgesia* for this diagnosis grouping and it was only documented at 32% across all audits.

5.3.5.2 Medication

Auditors reviewed medication charts and noted drugs prescribed. Not all patients were prescribed medication.

Table 27: Percentage documented (%D) of aspects of management for four diagnoses – drugs

Audit	1		2		3		4		Total		n	missing
	f	%	f	%	f	%	f	%	f	%		
T - Foreign Body												
Steroids	0	0	0	0	0	0	0	0	0	0	447	15
Antibiotics	88	80.73	83	74.11	101	88.6	94	81.03	366	81.15	451	11
Antivirals	0	0	1	0.92	0	0	0	0	1	0.23	441	21
ARE - painful diffuse conjunctival injection												
Steroids	0	0	5	5.95	1	0.95	3	3.16	9	2.51	359	11
Antibiotics	54	65.85	48	57.14	73	68.87	63	67.02	238	65.03	366	4
Antivirals	2	0.7	0	0	0	0	1	0	3	0.85	354	16
ARE - painful cornea abnormal												
Steroids	0	0	1	1.82	0	0	0	0	1	0.45	223	7
Antibiotics	56	84.85	43	78.18	36	75	50	86.21	185	81.5	227	3
Antivirals	2	3.23	3	5.56	0	0	0	0	5	2.26	221	9
T - Chemical Burn												
Steroids	1	4.55	0	0	1	4.17	0	0	2	2.63	76	1
Antibiotics	11	52.38	4	28.57	14	58.33	10	58.82	39	51.32	76	1
Antivirals	0	0	1	7.14	1	4.35	0	0	2	2.7	74	3

The guidelines in EEM note that “there is no indication for the use of steroids by non ophthalmologists”⁸.

Data in Table 27 show that steroids have been prescribed in small numbers for *ARE: painful, diffuse, conjunctival injection*, *ARE: painful cornea, abnormal* and *T: Chemical Burn*. Without reviewing the audited record it is not possible to tell whether this was with ophthalmologist consultation.

⁸ Eye Emergency Manual, First Edition 2007, p 26

5.3.6 Separation

92% of all patients presenting to an Emergency Department with an eye emergency are discharged home.

Table 28: Separation Patterns for all diagnoses

SEPARATION		
DC Home	1	92%
Admitted	1	2%
Transferred	1	4%
Not recorded	1	2%

Table 29 shows the separation patterns for all patients who presented to project site emergency departments with *T: foreign body*, *ARE: painful, diffuse conjunctival injection*, *ARE: painful cornea abnormal* or *T: chemical burns*.

Table 29: Separation Patterns for four diagnoses

Diagnosis		Not Recorded	Admitted	Discharged Home	Transferred	Total
T: Foreign Body	f	11	1	441	9	462
	%	2.38	0.22	95.45	1.95	
ARE: conjunctival injection	f	4	3	355	8	370
	%	1.08	0.81	95.95	2.16	
ARE: cornea abnormal	f	4	1	217	8	230
	%	1.74	0.43	94.35	3.48	
T: Chemical Burns	f	3		70	4	77
	%	3.90	0.00	90.91	5.19	
Total		22	5	1083	29	1139

95% of patients with separation documented who have been seen with the top three diagnoses and chemical burns were discharged home whilst 3% were admitted or transferred to another facility.

The audit tool asked for one category to be documented, however a small number of audits had multiple categories selected.

5.3.7 Follow up

The guidelines in the EEM recommend follow up for all eye emergencies. Non sight threatening conditions can be reviewed by a General Practitioner (GP) or Local Medical Officer (LMO) to ensure that the condition is resolving. More serious eye conditions require an ophthalmologist referral. The table below outlines documented onward referral following presentation to ED.

Table 30: Documented Follow Up⁹

	None	GP	ED	Ophthalmologist	OPD clinic	Other	Not recorded	Total
f	388	665	232	200	281	83	91	1940
%	20.45	35.06	12.23	10.54	14.81	4.38	4.80	102.27

⁹ Note: There were 43 audits (2.26%) in which there was more than one follow-up documented

The results show that follow up was not required in 20% of patients. Those followed up were referred to a GP (35%) and 25% were referred to an ophthalmologist either in rooms or in an out patient eye clinic. 5% did not have their follow up recorded.

5.4 Audit Results – data set #2

Data set #2 a subset of data set #1, excludes the first and fifth audit for Groups A2 and B2 (Tables 5 & 6) and comprises 1732 records or just over 84% of the data set #1.

5.4.1 Seen By

The *seen by* field was added in V#2 of the audit form and changed in V#3 (see section 3.5 and Appendix 2) and as noted in section 5.1 was recoded for consistency across audits 2 and 3.

The auditors were asked to record the designation of all clinicians who saw each patient therefore multiple clinicians may have seen the one patient. The categories: *Intern, JMO and RMO* have been combined as JMOs.

Table 31: Patient encounters with one or more clinicians

Seen By	f	%
1 Clinician	1411	81.47
2 Clinicians	92	5.31
3 Clinicians	2	0.12
4 Clinicians	1	0.06
Unknown	226	13.05
Total	1732	100

It is assumed that a JMO who has difficulty with an eye patient will seek more senior medical clinician support. 81% of patients were documented as seeing one clinician (Table 31). 38% of clinicians documented as seeing the patient were JMOs with 44% more senior clinicians (CMO/Registrar/ED Physician) (Table 32)

Table 32: Patient encounters with clinicians by designation

Seen By	f	%
JMO	661	38.16
CMO	407	23.50
Reg	270	15.59
GP	74	4.27
ED Phys	86	4.97
RN	60	3.46
NP	40	2.31
APN	7	0.40
Unknown	226	13.05

The total number of the clinicians from the eight designated groups who saw patients against all diagnoses is available in Appendix 8. Over a third of the eye emergencies have been seen by a JMO. These results do not show if the patient seen by a JMO has also been seen by a senior medical officer.

In an attempt to identify whether patients documented as seeing a JMO also saw a more senior clinician two diagnoses *T: Chemical Burn* and *T: Foreign Body* were reviewed. It was considered likely that JMO could require assistance with these diagnoses. (Tables 33 & 34)

Table 33: T: chemical burn – designation of clinician when patient seen by two clinicians

JMO	LMO	CMO	ED Phys	Registrar	NP	RN	APN
				1	1		
1				1			
1	1						
1				1			
		1		1			
1		1					
2							
	1					1	
1				1			

Five out of nine patients with a *chemical burn to the eye* seen by two clinicians were documented as being seen by a JMO and a more senior clinician. One patient saw two JMOs.

Table 34: T: Foreign Body – designation of clinician when patient seen by two clinicians

JMO	LMO	CMO	ED Phys	Registrar	NP	RN	APN
		1		1			
2							
			1		1		
1		1					
1				1			
1				1			
				1	1		
1						1	
1			1				
2							
	1			1			
1		1					
1		1					
1		1					
		1		1			
		1				1	
1		1					
	1					1	
	1					1	
	1					1	
1		1					

Nine of the 21 patients with a diagnosis of *T: Foreign Body* recorded as seeing two clinicians were seen by a JMO and a more senior clinician. Two patients were seen by two JMOs.

5.4.2 Examination – Use of Slit Lamp

Documentation of *slit lamp* has shown a significantly improving trend ($p=0.0404$) across all audits.

The guidelines in the EEM recommend the use of the slit lamp to examine a patient with *T: Foreign Body*, *ARE: painful, cornea, abnormal* and *T: chemical burn* to determine the extent of the epithelial defect. The use of the slit lamp was documented at over 50% for these three diagnoses however there was no statistically significant improvement in documentation of its use.

Table 35: Documented Use of Slit Lamp

Dx	% documented across audits
T: Foreign Body	57
ARE: Painful diffuse conjunctival injection	40
ARE: Painful, cornea abnormal	64
T: Chemical Burn	54
All Dx	48

5.4.3 Management - Use of Local Anaesthetic

The use of analgesia and local anaesthetic drops were considered by project teams as they reviewed their processes (Section 4.1.5). 56 % of project sites identified as a problem that eye patients have to wait in pain to see a medical officer. For example patients presenting to EDs with flash burns from welding or UV exposure or chemical burns commonly describe a great deal of pain. Until pain is managed patients are often unable to provide a clear history or to focus on instructions. Early administration of pain relief ensures that the patient can be reassured and made more comfortable within minutes of arrival at triage.

A solution to the problem was the implementation of standing orders for nurse administration of analgesia and local anaesthetic for flash burns and chemical burns. The recording of analgesia is reported in section 5.3.5.

The guidelines in the EEM recommend the use of local anaesthesia for both *T: foreign body* and *T: chemical burn*.

Table 36: Use of Local Anaesthetic

	T: FB	T: Chemical Burn
Audit 1	29	9
% Total	52.93	64.29
Audit 2	64	5
% Total	55.65	35.71
Audit 3	64	12
% Total	56.14	50
Audit 4	74	11
% Total	63.25	64.71
Total No. documented	231	37
% Total Audits	57.6	53.62

There was no statistically significant improvement in the documentation of anaesthetic in either of these diagnosis groupings (Table 36). Documentation on average was a little over 50% for both.

5.5 Summary of Audit Findings

Analysis of the audit results provides us with an overview of eye emergency patients presenting to the participating NSW EDs:

- Patients between 14 – 65+ years of age comprised 81% (Table 8) of the eye emergency records audited. Just over 13% of patients were children up to and including 13 years of age. Age was unknown in over 6% of records.
- Three diagnosis groupings make up 56% of the eye emergency work audited in EDs i.e. *T: foreign body*, *ARE: painful diffuse conjunctival injection/conjunctivitis*, and *ARE: painful, cornea abnormal*. 4 % of eye emergency caseload is *T: chemical burn of the eye/s* (Table 9). These four specific diagnoses comprise 60% of ED workload.
- 10% of records did not have a diagnosis or presenting problem documented (Table 9)
- Triage category was not recorded in 1.74% of audits
- The four specific diagnoses were triaged:
 - 56% of the patients audited with a diagnosis of *T: foreign body*, were given the recommended ATS category of 4. When not given the recommended ATS category, these patients were more likely to be triaged higher
 - 77% of *ARE: painful, diffuse conjunctival injection* patients triaged higher than the recommended ATS category of 5
 - *ARE: painful, cornea abnormal* patients were triaged at the recommended ATS category of 4, 46% of the time whilst 38% were triaged higher
 - 72% percent of patients presenting with *T: chemical burn of the eye/s* were given an ATS category lower than the recommended ATS category of 2 which reflects the potential of a vision threatening condition
- 81% of patients were documented as seeing only one clinician (Table 31) with 38% seeing a JMO, 24% a CMO and 16% a Registrar reflecting the staffing mix of EDs in the project (Table 32)
- Just over 5% (92 patients) of all patients were documented as being seen by two clinicians
- 92 patients were identified as having an encounter with 2 clinicians (Table 31), with four out of six for *T: chemical burn* and 9 out of 21 for *T: foreign body* seen by a JMO and more senior clinician (Tables 33 & 34).
- The designations of the two clinicians documented as seeing the 9 patients presenting with *T: Chemical Burn of the eye/s* and 21 patients presenting with *T: Foreign Body* (Tables 33 & 34) were a mix of senior and junior medical and nursing clinicians for each patient
- In 13% of records the clinician who attended the patient was unknown
- 481 (81%) patients had documented follow up (Table 30) with an ophthalmologist or ophthalmology registrar in private rooms, or in the outpatient eye clinic or with the GP.
- 92% of patients were discharged home, 2% did not have separation recorded
- Those followed up were referred to a GP (35%) and 25% were referred to an ophthalmologist either in rooms or in an out patient eye clinic.
- The results show there was no documentation of follow up, for 5% of patients.

6 Discussion

The consensus clinical guidelines published in the EEM were developed in response to anecdotal evidence that junior medical staff had limited skills to manage eye emergencies. Consequently the EEM was designed to assist non-ophthalmic clinicians to manage eye emergencies, particularly in EDs without an ophthalmic presence.

This section of the report will consider the audit results against the project aims:

- To encourage clinician use of the EEM
- To improve the assessment and management of patients presenting to EDs with eye problems
- To evaluate the effectiveness of the EEM in improving patient care for patients presenting to EDs with eye problem

Participating sites were a mix of principal referral, metropolitan and district hospitals in rural and metropolitan areas (Appendix 1) many without an ophthalmic presence.

6.1 Clinical Practice Improvement

Audit results were analysed to identify whether the combination of resources identified in Section 3.6 and the introduction of the consensus clinical guidelines in the EEM as part of a project managed by a project officer using modified CPI methodology and clinician education (Section 4) led to improvements in documentation of care. The effect of a specific resource i.e. the EEM on documentation is difficult to isolate and identify however there has been a statistically significant improvement in the documentation of slit lamp and visual acuity across all diagnoses (Table 37) suggesting that these resources have influenced improvement in the documented care.

Table 37: % Documented improvement following implementation of identified solutions

Legend for Diagnoses					
1. All Diagnoses		2. T: Foreign Body		5. T: Chemical Burn	
3. ARE: Painful diffuse conjunctival injection		4. ARE: Painful. cornea abnormal			
Problem	Solutions applied	Condition reported	% documented across 4 audits	Significant improvement	P value
Slit Lamp	Maintenance, Eye Room set up, education	1	48%	Yes	0.0404
		2	57%	No	N/A
		4	64%	No	N/A
Visual Acuity	Review of charts & position, floor markings, light box maintenance, education	1	67%	Yes	0.0262
		2	70%	No	N/A
		3	60%	No	N/A
		4	73%	No	N/A
		5	69%	No	N/A
Irrigation for Chemical Burn	SOP, Policy & Proc, Tool Kit, Education	5	78%	No	N/A
Local Anaesthesia	Standing Orders	2	58%	No	N/A
		5	54%	No	N/A
Analgesia	Standing Orders	2	21%	No	N/A
		5	32%	No	N/A

The use of the *Slit Lamp* is recommended in the EEM for *T: Foreign Body* and *ARE: Painful Cornea Abnormal*. Over four audits the documentation was average at 57% and 64% (Figure 1) respectively and despite the application of considerable resources there was no statistically significant improving trend in documentation of slit lamp use for these diagnoses. There was however a significant improvement for this examination data item across all diagnoses (p value=0.0404).

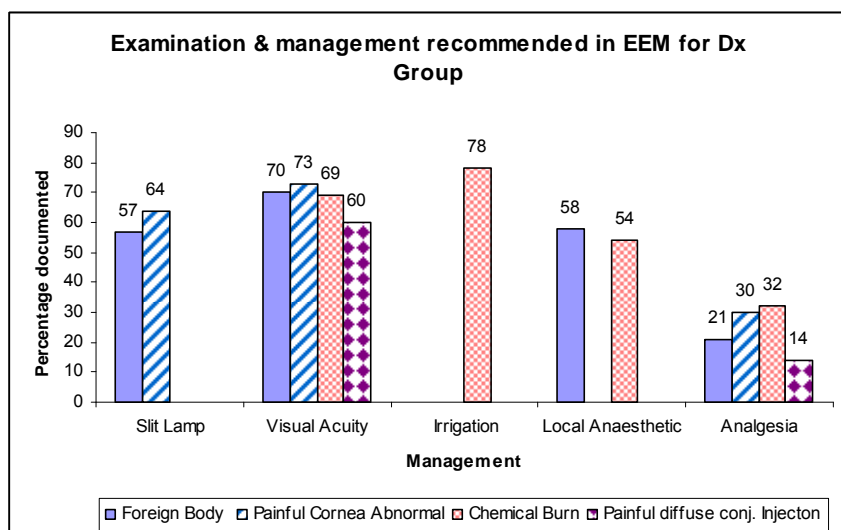
There was a statistically significant improving trend in the documentation of examination data item *visual acuity* across all diagnoses ($P=0.0262$). Interestingly this trend was not identified for the three most frequent presentations and chemical burn with documentation across audits at 67% and ranging between 60-73% for these diagnoses.

Even though documentation of the management data item *irrigation* for *T: Chemical Burn* was high at 78% there was no statistically significant improving trend over the project. Considerable discussion occurred about irrigation as ED clinicians contributed to the development of the second edition of the guidelines in the EEM. In particular a draft irrigation procedure was developed and subsequently included in the second edition by the EEM Review Group.

The documentation of *instillation of local anaesthetic* for *T: Foreign Body* (58%) and *T: Chemical Burn* (54%) as recommended in the EEM was just above average and did not show significant improvement despite considerable time and attention from the project teams - eight sites introduced standing orders for nurse administration of local anaesthetic.

It was reported that standing orders for *analgesia* were in place however documentation was low across all four diagnoses. The guidelines in the EEM recommend use of oral analgesia as required for *T: Foreign Body* (21%)

Figure 1: %documented of examination and management data items recommended in the EEM



RECOMMENDATIONS:

- Education about the slit lamp and its use, irrigation for chemical burn, and the use of local anaesthetic and analgesia for painful eye condition is required on a regular basis
- The use of local anaesthetic and analgesia for painful eye conditions need to be considered in the next review of the clinical guidelines in the EEM

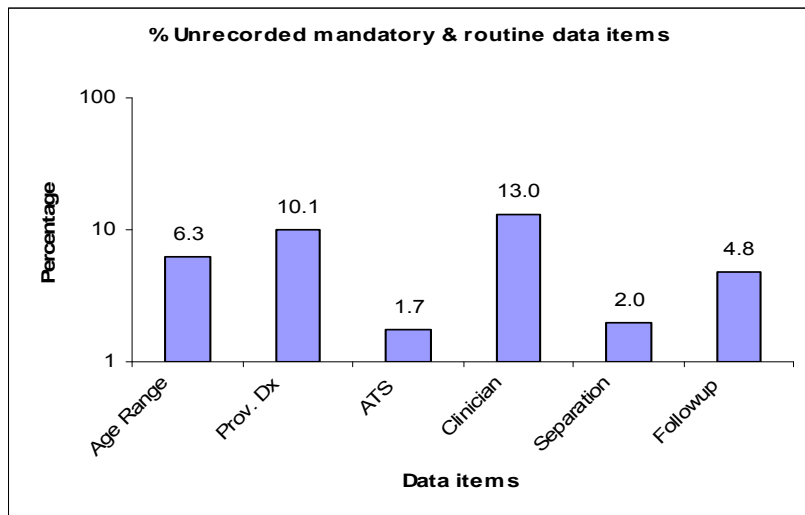
6.2 Mandatory & Routine Documentation

Documentation was used as a surrogate for care given – *if it wasn't documented then it was assumed that care was not given*. It was identified early in the project during medical record audit that documentation of eye assessment and management was poor. The project did not set out to improve documentation however it was anticipated that with the use of the guidelines and education that clinicians would have increased knowledge and be able to better document the patient's care.

Mandatory data items are entered into the ED Information Management System (EDIS) and the hospital Patient Administration System (PAS) if the patient is admitted. Those under consideration are *date of birth*

which provides age range for the auditor, *provisional diagnosis* and *admitting clinician* if the patient is admitted, and *separation*. ATS category as noted in section 3.5 is a hospital registration requirement. Follow up is not mandatory. Mandatory data items were documented at 90% across all audits except for *attending clinician* (Figure 2) which was not available in 13% of records. *Admitting clinician* is a mandatory field for an admitted patient however auditors were auditing the written record and may not have accessed EDIS or the PAS. It was therefore not possible to determine whether the 13% of records without an *attending clinician* were discharged home or whether the patient had been admitted with an *attending clinician* recorded in the PAS.

Figure 2: Documentation of mandatory and routine data items

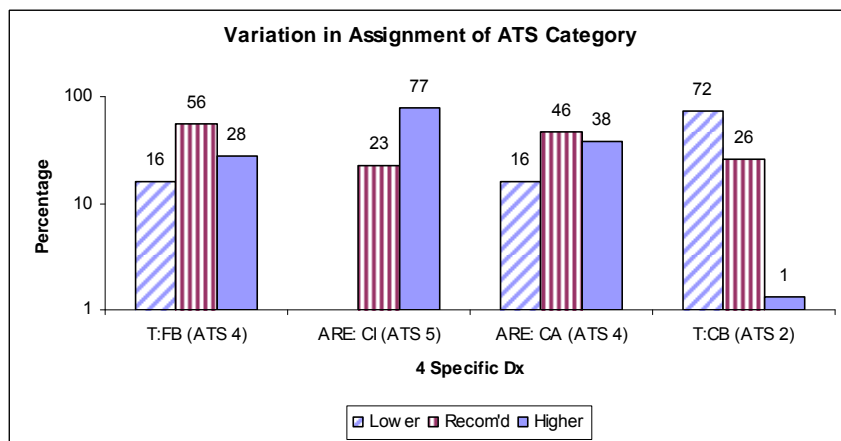


Documentation of *ATS category*, *attending clinician*, *separation* and *follow up* highlighted issues for further attention as the EEM provides guidance on all items except *separation*.

6.2.1 Triage

The ATS category is assigned after assessing a wide range of factors which reflect the urgency of the timeframe within which the patient needs to be seen. Figure 3 provides an overview of the variation which occurs with the assignment of the ATS category for specific diagnoses compared with the recommended ATS category in the EEM. Records without an ATS category documented were excluded.

Figure 3: Variation in assignment of recommended ATS category for 4 specific diagnoses



T: Chemical Burn of the eye/s

In the first edition of the EEM the recommended ATS category for *T: chemical burn* is the only ATS Category 2 – this indicates that the patient needs to be assessed and treatment commenced within 10 minutes. Triaging lower will delay treatment which for a chemical burn of the eye/s would delay irrigation with possible vision threatening consequences.

During the project teams reviewed their processes for the management of ATS category 2 eye emergencies and implemented changes to work flows and communication. Despite changes all children and over 70% of adult patients presenting with *T: chemical burn* were triaged to a lower ATS category i.e. 72 % of patients presenting with *T: chemical burn of the eye/s* were given an ATS category lower than the recommended ATS category of 2.

This is a concern for ophthalmic clinicians given project resources applied to this diagnosis as it would indicate less timely care for a possible organ threatening injury and would indicate a lesser level of care provided. It could also indicate that the guideline in the EEM is not being used and therefore not effective in improving the management of eyes in EDs.

Figure 4: Variation from recommended ATS category *T: chemical burn of the eye/s*

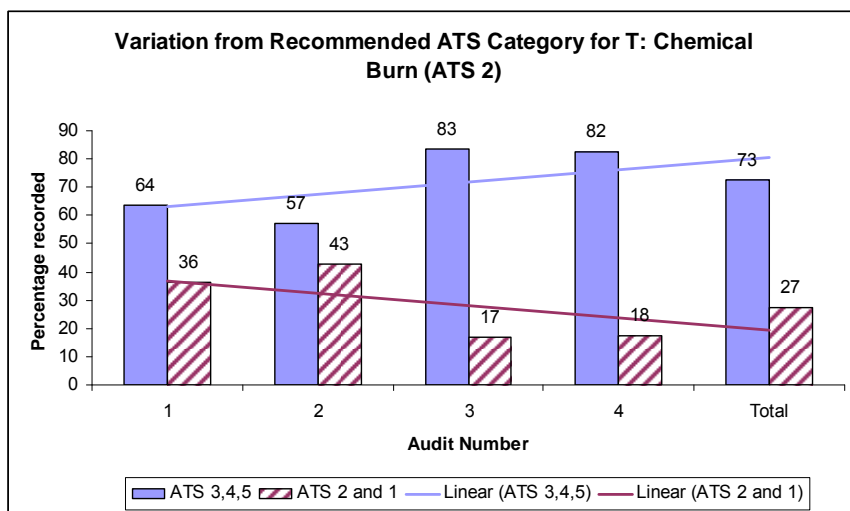


Figure 4 shows that between Audit 2 and 3 documentation of the recommended ATS category dropped by half and remained low for Audit 4. Numbers in the series are small and this drop in ATS category recorded was not statistically significant.

Triaging higher means the patient is seen more quickly which would not be detrimental to care. Critical indicators that would increase a triage category were not audited e.g. if the patient had only one good eye this would increase the expected ATS category allocated and this particular history detail was not collected by the audit tool.

ARE: painful, diffuse conjunctival injection

In an attempt to understand why patients were triaged higher the relationship between age and diagnosis was considered. 77% of *ARE: painful, diffuse conjunctival injection* patients triaged higher than the recommended ATS category 5 (Figure 3). There was the greatest representation of children aged between 0 – 13 years for this diagnosis grouping (23) which includes conjunctivitis for which it was more likely that children will present than adults. It was found that age does not seem to influence this ATS category as both adults and children were triaged higher than the recommended ATS category 5 with a greater representation of adults in this sample i.e. adults 80% and children 70%.

It was suggested that the recommended ATS category could be too low as emergency clinicians were triaging higher more than 75% of the time.

Approximately 50% of both *T: foreign body* and *ARE: painful, cornea abnormal* patients were triaged at the recommended ATS category and both were more likely to be triaged higher than lower (Fig. 3).

RECOMMENDATIONS:

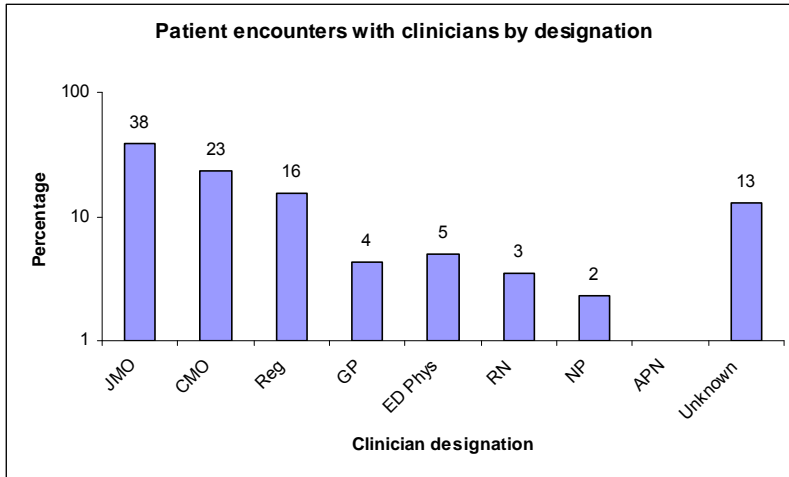
- Undertake further study is to identify the issues which determine the ATS category assigned for chemical burns to the eye/s including appropriateness of assigned ATS Category.
- Education is required about the urgency of treatment for chemical burn to the eye/s. This needs to be targeted at clinicians who triage patients and could be provided through the Eye Emergency Clinician Education Workshops currently being provided
- Review the recommended ATS category for *ARE: painful, diffuse conjunctival Injection* and consider changing it to ATS 4

6.2.2 Attending clinician Issues and patient follow up

Given that the catalyst for the development of the guidelines was a concern about the ophthalmic skills of JMOs working in EDs it was seen as important to consider the seniority of medical clinician seeing the patient. It is assumed that any JMO who has difficulty with an eye patient will seek more senior medical clinician support.

38% of clinicians documented as seeing the patient were JMOs, a mix of interns, JMOs and RMOs grouped for reporting purposes, and 24 % CMOs (Table 32). Figure 5 reflects the clinician mix of EDs in the project.

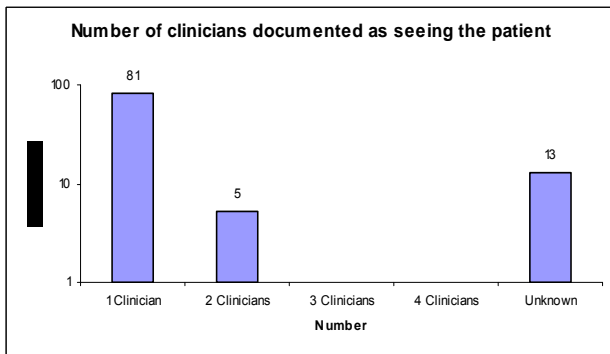
Figure 5: Patient encounters with clinicians by designation



81% of patients were documented as seeing only one clinician with just over 5% (92 patients) of all patients documented as seen by two clinicians (Figure 6).

The first attending clinician is well documented however given the anecdotal evidence that junior medical staff had limited skills to manage eye emergencies the low level of documentation of a second attending clinician was a concern. Were junior medical staff not seeking assistance or was assistance sought and not documented by more senior emergency staff?

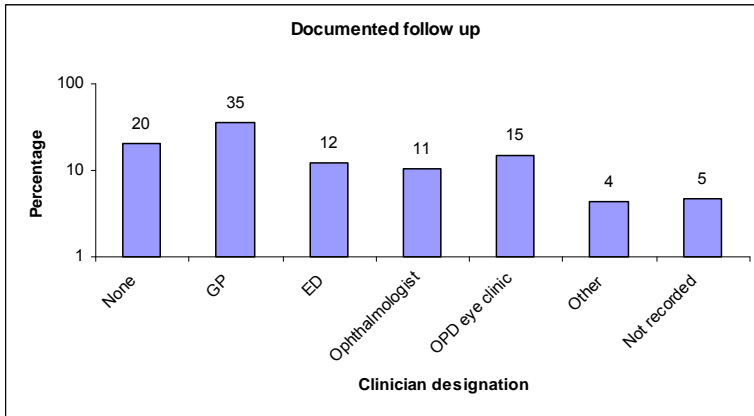
Figure 6: Number of clinicians documented as seeing the patient



The designations of the two clinicians documented as seeing the 9 patients presenting with *T: Chemical Burn of the eye/s* and 21 patients presenting with *T: Foreign Body* (Tables 33 & 34) were a mix of senior and junior medical and nursing clinicians for each patient.

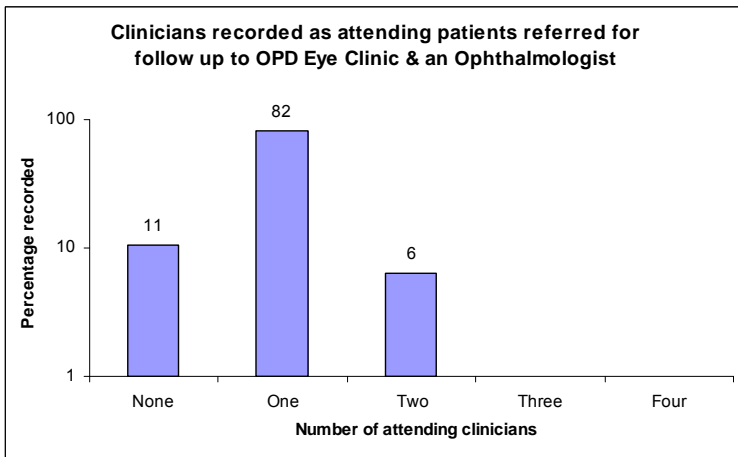
92% of patients were discharged home with 35% of documented follow up to the GP and 26% of patients had documented follow up with an ophthalmologist or ophthalmology registrar in private rooms or the outpatient eye clinic (Figure 7).

Figure 7: Documented follow up



With over a third of documented follow up to GPs, an understanding of their eye emergency skills and need for education is required. Anecdotal evidence from GPs attending the Eye Emergency Clinician Education Workshops based around the guidelines in the EEM and being run in parallel with this project indicates that the education is sought after and useful.

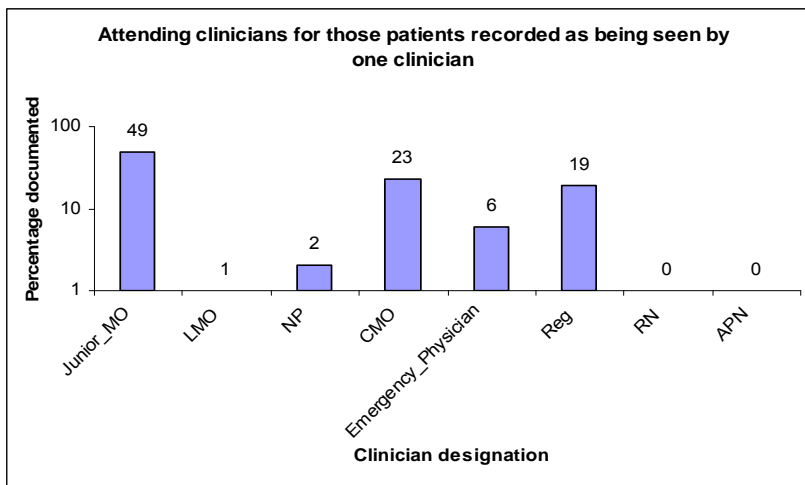
Figure 8: Clinicians recorded as seeing patients who have been referred for follow up in OPD Eye Clinic or to an Ophthalmologist



Of those patients referred for follow up in an outpatient eye clinic or in ophthalmologists' rooms 82% had only one attending clinician recorded and 11% none.

One of the recommendations from the Ophthalmologists survey conducted during the project was for a more senior clinician to see the patient prior to referral. Of those patients documented as seeing one clinician almost 50% saw a JMO whilst the remainder saw a mix of more senior medical clinicians (Figure 9). This may reflect one of the reasons Ophthalmologists surveyed during the project requested that a patient be seen by a more senior clinician prior to referral.

Figure 9: Designation of clinicians recorded as attending those patients seen by one clinician who were referred for follow up by OPD Eye Clinic & an Ophthalmologist



RECOMMENDATIONS:

- Provide ongoing education for JMOs as they are frequently the only medical clinician documented as seeing the patient
- Consider expanding Eye Emergency Clinician Education to include GP's as follow up is with the GP for over one third of patients
- Improve documentation of the second or more senior attending clinician especially prior to referral to a GP, Ophthalmology rooms or an outpatient eye clinic
- Provide an electronically generated referral letter from Firstnet to the GP

6.3 Documentation of eye emergency patient data items

Routine eye examination is outlined in the guidelines in the EEM both generally and more specifically for common eye emergencies. It was expected that all data fields in the audit sheet would be completed for all records except for those which were diagnosis specific i.e. fundus exam, use of slit lamp, fluorescein, mechanism of injury and time of injury.

The four specific diagnoses include two Trauma diagnoses and two Acute Red Eye provisional diagnoses, in which *mechanism* and *time of injury* are not relevant. These fields were excluded for Figures 10 & 11 when considering improvement across all diagnoses.

Various aspects of history and examination can be summarized and considered across all diagnoses. ED management is diagnosis specific and data could not be summarized and presented across all diagnoses.

Overall the percentage documented for various aspects of history and examination was higher for history. Documentation includes both a yes and no answer and so any improvement cannot be seen as signifying that the test/procedure was undertaken only that it was documented.

Statistically significant improvement in documentation occurred with two 'history' data items and five 'examination' data items.

Figure 10: Trends in History Documentation for all diagnoses

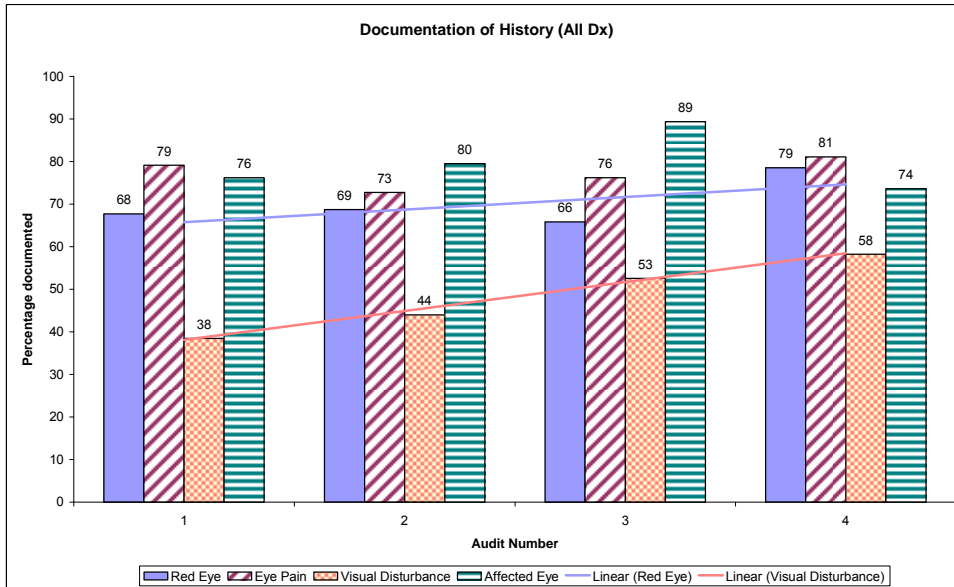
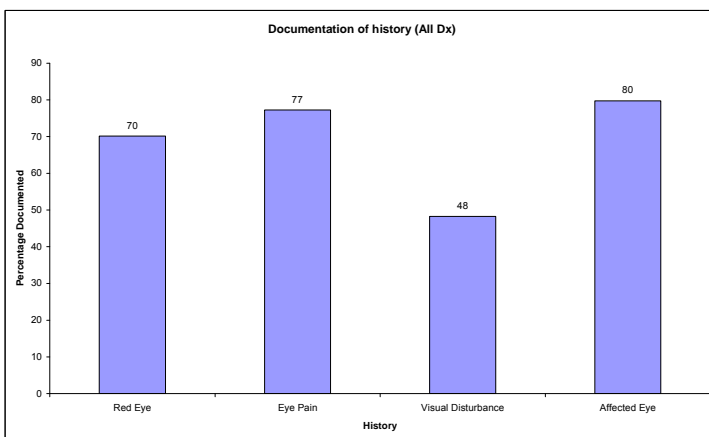


Figure 11: History documentation for all diagnoses



Figures 10 & 11 summarize results of documentation of history for all diagnosis. Two aspects of history documentation showed statistically improving trends:

- The documentation of *red eye* was 70% across audits and this has shown a statistically significant improving trend ($P=0.0022$) in recording over the four audits.
- *Visual disturbance* was documented at 48% across audits showed a statistically improving trend. ($P<0.0001$)
- *Eye pain* and *affected eye* were well recorded at 77% and 80% respectively across audits.

As noted in section 5 some 'history' data items did show statistically significant improvement for specific diagnoses i.e. *visual disturbance* for *T: Foreign Body*, *ARE: painful cornea abnormal* and *T: Chemical Burn*, *red eye* for *T: Foreign Body* and *eye pain* for *ARE: painful diffuse conjunctival injection*. As well *Time of injury* showed statistically significant improvement for *T: Chemical Burn* ($P=0.0360$) and *T: Foreign Body* ($p<0.0001$) and *Mechanism of Injury* for *T: Foreign Body* ($P=0.0173$).

Table 38 provides a summary of history and examination data items which have shown statistically significant improvement in documentation across all audits for all diagnoses and the four specific diagnoses.

Table 38: Summary of significant improvement for history and examination data items

	All Dx	T:FB	T:CB	ARE: PCA	ARE: PDCI
History					
Visual Dist	x	x	x	x	
Red Eye	x	x			
Eye Pain					x
Affected Eye					
Time of Injury		x	x		
Mechanism of Injury		x			
Examination					
Fluorescein	x	x			
Slit Lamp	x				
External Lids	x	x			
Pupils	x				
Fundus		x			
Visual Acuity	x				
Neuro Exam					

X = data item showing significant improvement in

The audit tool captured the documentation of seven data items relating to examination. Figure 12 graphically represents trends in documentation for these data items.

Figure 12: Trends in examination documentation for all diagnoses

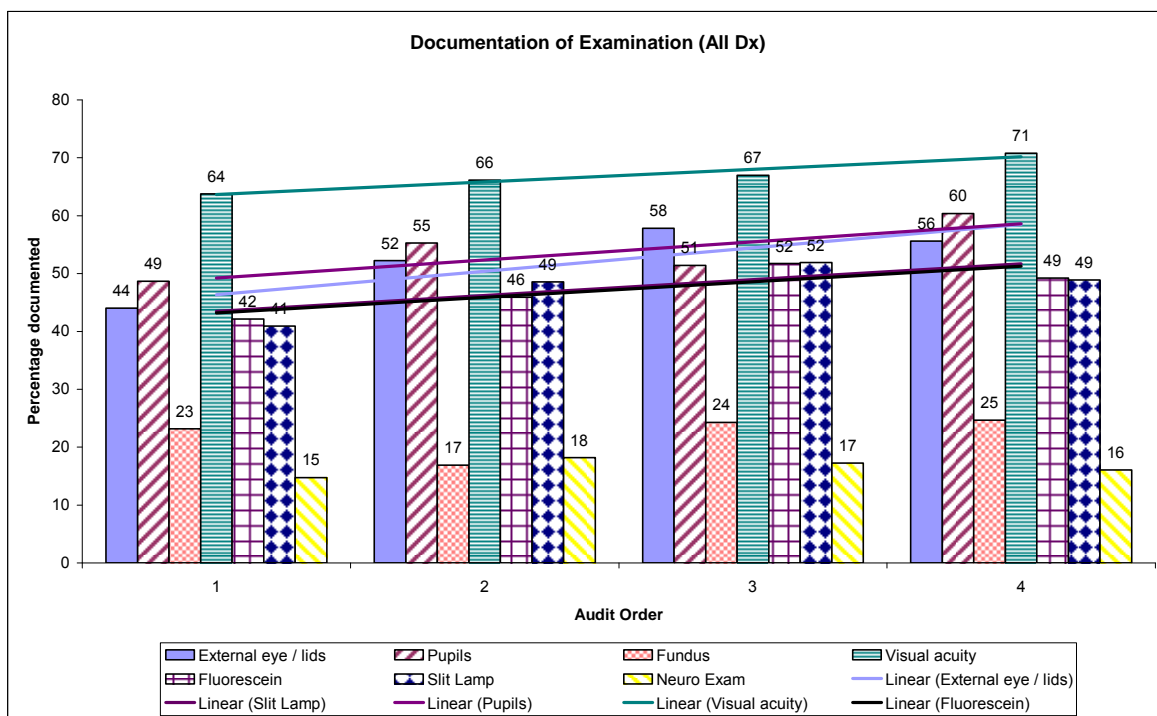
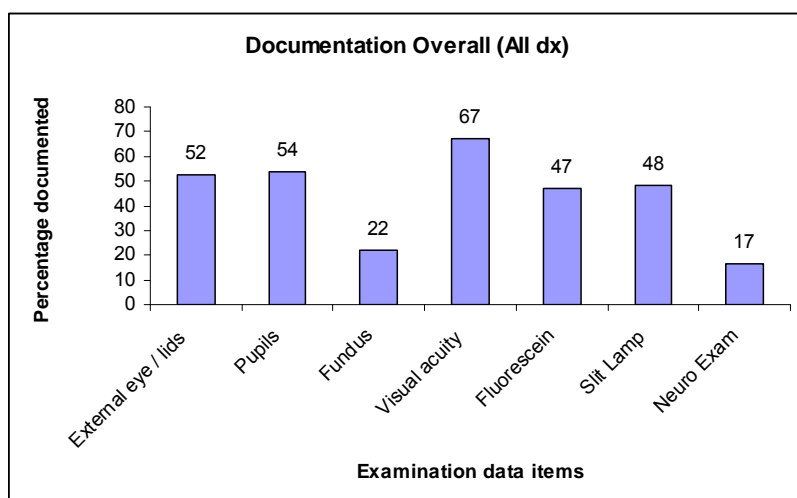


Figure 13: Examination documentation for all diagnoses



Fundus examination was documented at 22% (Figure 13) which indicates that 78% of audits did not have documentation. It is noted that an ophthalmologist would not expect the *fundus* to be examined routinely for an acute eye emergency therefore it is suggested that *fundus* examination was not documented or undertaken as it wasn't considered clinically relevant for the presenting problem.

The documentation of *fluorescein* (47%) and *slit lamp* (48%) across audits showed statistically significant improvement for all diagnoses with a p value of 0.0088 and 0.0404 respectively. As well there was a significant improvement in the documentation of *fluorescein* (45%) for *T: Foreign Body* (p value 0.0025) (Table 38). This is encouraging despite no significant improvement for the two diagnosis groupings of *ARE: Painful cornea abnormal* and *T: Chemical Burn* for which these examination tools are recommended in the EEM. As noted in section 6.1 considerable education resources were applied to the operation and maintenance of the slit lamp.

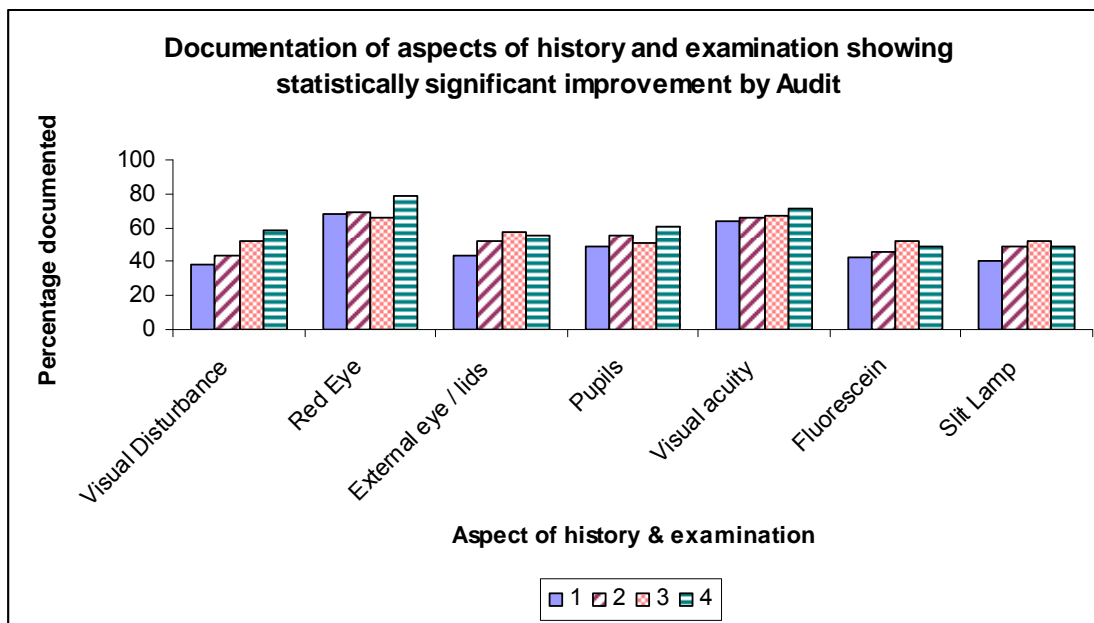
External eye/lids, *pupils* and *visual acuity* were all documented at more than 50% across audits and were showing statistically significant improvement i.e. *External eye/lid* examination (P = 0.0001), *pupil* examination (P = 0.0031) and *visual acuity* (P = 0.0262).

Statistically significant improving trends were identified in the documentation of *external eye/lid examination* (P = 0.0113), and *fluorescein* (P = 0.0025) for *T: Foreign Body* diagnosis grouping both examination tools recommended in the EEM. *Fundus examination* (P = 0.0285) also showed significant improvement despite no recommendation on the need for fundus examination in the guidelines in the EEM for this diagnosis grouping.

There was no significant improvement in the documentation of 'examination' data items for diagnosis groupings *ARE: Painful diffuse conjunctival injection*, *ARE: Painful cornea abnormal* and *T: Chemical Burn*.

In summary the introduction of the guidelines in the EEM as an appropriately resourced project has improved the documentation of aspects of history and examination. The aspects of history and examination which showed statistically significant improvement across audits for all diagnoses are presented in Figure 14 below.

Figure 14: Documentation of aspects of history and examination showing significant improvement across four audits for all Dx



RECOMMENDATIONS:

- Continue regular education for history and examination of eyes both in general and for specific frequently presenting diagnoses

There was no statistically significant improvement in documentation of any aspect of patient management which is diagnosis specific. A particular aspect of patient management however may have been well documented:

- *Irrigation* at 78% across the four audits (Table 25)
- *Foreign body removal* at 66%(Table 22)

Urgent ophthalmology consultation is recommended by the EEM for *T: chemical burn* and approximately 30% (22 patients) only had this documented.

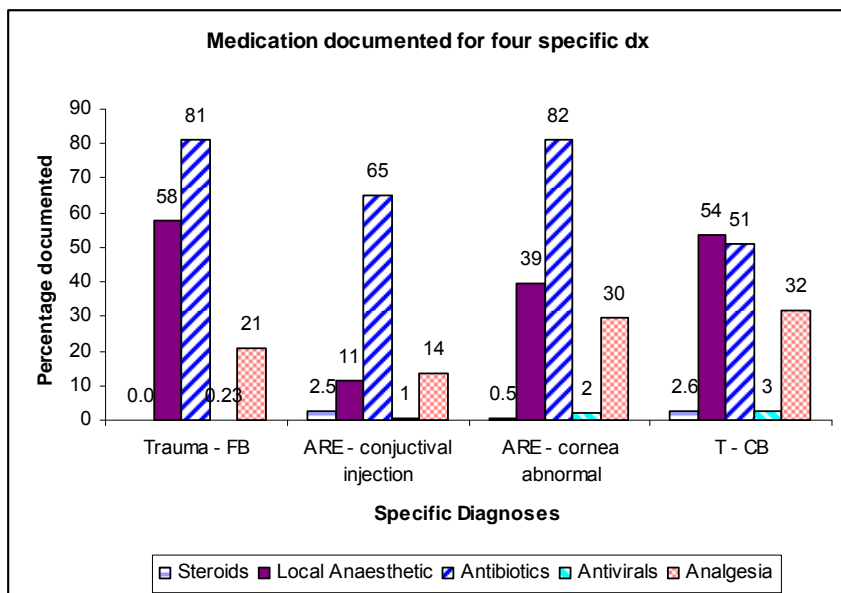
Auditors reviewed medication charts and noted drugs prescribed. Not all patients were prescribed medication:

- Documentation of analgesia was low (Tables 21 – 25) even though the guidelines in the EEM recommend the use of analgesia for *ARE: painful, cornea, abnormal* and *T: foreign body* documented at 30% and 21% respectively. The guidelines are silent for *T: chemical burn* and *ARE: painful, diffuse, conjunctival injection* which were documented 21% and 14% respectively.
- As noted earlier the guidelines in the EEM recommend the instillation of local anaesthetic drops for both *T: Foreign Body* and *T: Chemical Burn* which were documented on average at 58% and 54% respectively (Figure 1).
- The EEM notes that ‘there is no indication for the use of steroids by non ophthalmologists’¹⁰. Data in Table 26 show that steroids have been prescribed in small numbers for *ARE: painful, diffuse, conjunctival injection, ARE: painful cornea, abnormal* and *T: Chemical Burn*. Without reviewing the audited record it is not possible to tell whether this was with or without ophthalmologist consultation.
- The EEM recommends antibiotic treatment for both *ARE: painful, diffuse, conjunctival injection, and ARE: painful cornea, abnormal* depending on the specific diagnosis. Antibiotics are also recommended for *Corneal Foreign Body*. Audit results indicate that antibiotics were documented as given for (Figure 15):
 - *ARE: painful, diffuse, conjunctival injection* in 65% of records,

¹⁰ Eye Emergency Manual, First Edition 2007, p 26

- 82% for ARE: *painful cornea, abnormal* and
 - T: *Foreign Body* 81% of records.
 - The manual is silent on medication for T: *Chemical Burn* with antibiotic recorded in 51% of audits
- Recording of antiviral use was very low for all four specific diagnoses

Figure 15: Documentation of medication for four specific diagnoses



Antibiotics where recommended for a specific diagnosis grouping are well documented with installation of local anaesthetic documented at just over 50% and analgesia poorly documented. It is of concern that recommended medication is not being given as it is assumed that if it was given it would have been documented on the medication chart which is a legal requirement.

Project sites developed and trialled an *Eye Emergency Assessment Form* to address poor documentation of eye assessment and management. Disappointingly a count of forms during audit #4 and #5 showed minimal use of the assessment form. During the project development commenced in Sydney West Area Health Service on an electronic eye assessment chart to be included in the Emergency Department information system, Firstnet.

RECOMMENDATIONS:

- Improve the documentation of patient management in general
- Improve the management of chemical burns to the eye/s, including the need for urgent ophthalmology consultation
- Encourage the development and implementation of standing orders for local anaesthesia and use of analgesia for painful eye conditions
- Review the guidelines in the EEM re pain relief
- Educate emergency clinicians and GPs about the use of steroids in the eye in the absence of ophthalmology consultation
- Progress development of the electronic eye assessment chart for inclusion in Firstnet state-wide

7 Project Forum

In November 2008 an end-of-project forum was held where project teams presented their experience with involvement in the project in particular how they applied the CPI methodology, improvements in emergency eye care implemented, challenges to implementation and suggestions to sustain improvements.

Problems identified and solutions implemented are reflected in the Section 8 Recommendations. To sustain improvements project teams identified education including:

- Increased exposure for medical students to eye assessment and management at an undergraduate level
- Encourage participation in graduate certificates of nursing specializing in ophthalmic issues for nurses
- Continue to support the 'Train the Trainer' programs provided at Sydney/Sydney Eye Hospital
- Improve documentation of eye emergencies by inclusion of an eye assessment chart in the electronic medical record (EMR)
- Provide easy electronic access to the eye emergency clinical guidelines in EDs as well as investigating the capacity to download to smart phones

8 Recommendations

Recommendations noted in previous sections have been summarized below:

- I. Establish a sustainable eye emergency clinician education program based on the Eye Emergency Clinician Education Workshops currently being provided and the guidelines in the EEM for emergency department clinicians.
- II. Consider :
 - expanding the program to include GP's into whose care over one third of patients are discharged
 - continued support for 'Train the Trainer' programs provided at Sydney/Sydney Eye Hospital
 - increased exposure for medical students to eye emergency assessment and management
 - encouraging participation in graduate certificates of nursing specializing in ophthalmic issues for nurses
- III. Incorporate project findings into a sustainable eye emergency clinician education program in particular:
 - the slit lamp and its use, irrigation for chemical burn, and the use of local anaesthetic and analgesia for painful eye conditions
 - the urgency of treatment for chemical burn to the eye/s including appropriate ATS category and ophthalmologist referral
 - education for JMOs as they are frequently the only medical clinician documented as seeing the patient and for GPs who are most likely to be referred patients following attendance at ED
 - encourage the development and implementation of standing orders for local anaesthesia and use of analgesia for painful eye conditions
 - the use of steroids by JMOs, ED clinicians and GPs for eye emergencies
- IV. Undertake a review of the second edition of the clinical guidelines in the EEM prior to further printing in particular the recommended ATS category for *ARE: painful, diffuse conjunctival Injection* and the inclusion of pain relief for common emergencies
- V. Undertake further study to identify the issues which determine the ATS category assigned for chemical burns to the eye/s including appropriateness of the assigned ATS Category.
- VI. Improve the documentation of management of eye emergencies in EDs in general and in particular:
 - the documentation of the attending clinician including the second or more senior attending clinician especially prior to referral to the GP, Ophthalmology rooms or an outpatient eye clinic
 - progress development of the electronic eye assessment chart for inclusion in Firstnet state-wide (ED Information Management System)
 - the provision of an electronically generated referral letter from Firstnet to the GP
 - provide easy electronic access to the eye emergency clinical guidelines in EDs as well as investigating the capacity to download to Smartphones

9 Summary

The consensus clinical guidelines published in the EEM were developed in response to anecdotal evidence that junior medical staff had limited skills to manage eye emergencies. Consequently the EEM was designed to assist non-ophthalmic clinicians to manage eye emergencies, particularly in EDs without an ophthalmic presence.

During the project clinicians in all participating EDs and attending education sessions were provided with a copy of the EEM and encouraged to use it. It was also available on line.

Documentation was used as a surrogate for patient care on the assumption that if care wasn't documented it wasn't provided or identified as not required. Levels of documentation ranged between no documentation to very high levels across diagnoses and data items both routinely collected and those specific to history, triage, assessment and management.

The introduction of the guidelines in the EEM as an appropriately resourced project has significantly improved the documentation of aspects of history and examination across audits for all diagnoses. The aspects showing improvement are visual disturbance, red eye, fluorescein, slit lamp, external lids, pupils and visual acuity (Figure 14).

There was no significant improvement in the documentation of the management of eye emergencies.

It is noted that the effect of a specific resource on patient care and the documentation of that care is difficult to isolate and identify and as such it is only possible to say that all the project resources including the application of CPI methodology, the provision of the EEM and encouragement to use it led to the improvement in documentation in some aspects of care and by extrapolation patient care.

It was suggested that documentation was not a robust surrogate for care as documentation was often poorly done. Figure 2 identifies that there was no documentation across audits for attending clinician (13%), provisional diagnosis/ presenting problem (10%), separation (2%), follow up (5%) and ATS category (1.7%).

The project provided a picture of eye emergency care in participating NSW public hospital EDs:

- 56% of eye emergencies could be assigned to three diagnosis groupings of *T: foreign body*, *ARE: painful diffuse conjunctival injection/conjunctivitis*, and *ARE: painful, cornea abnormal* with an additional 4 % of eye emergency caseload being *T: chemical burn* of the eye/s.
- 81% of patients were documented as seeing only one clinician (Table 31) with 38% seeing a JMO, 24% a CMO and 16% a Registrar reflecting the staffing mix of EDs in the project
- 92% of patients were discharged home - 81% with documented follow up including referral to a GP (35%) or to an ophthalmologist in rooms or in an outpatient eye clinic (25%).

Recommendations arising from discussion of project findings include:

- The need for sustainable eye emergency clinician education
- The need for improved documentation
- A third review of the guidelines to incorporate project findings
- Identification of the issues for appropriate triaging of chemical burn to the eye/s

In summary the introduction of the eye emergency clinical guidelines published in the Eye Emergency Manual as a resourced project has improved patient care for certain aspects of history and examination.

APPENDIX 1: PROJECT SITE BY HOSPITAL DESIGNATION

	Group A		
B212	Manly Hospital	Major Metropolitan	Jul-07
B214	Mona Vale Hospital	Major Metropolitan	Jul-07
J216	Tamworth Hospital	Major Non Metropolitan	Jul-07
Q230	John Hunter Hospital	Principal Referral Group A	Jul-07
P208	Wollongong Hospital	Principal Referral Group B	Jul-07
Q214	Belmont Hospital	District Group 1	Jul-07
Q217	Singleton Hospital	District Group 2	Jul-07
A202	Canterbury Hospital	Major Metropolitan	Jan-08
D206	Fairfield Hospital	Major Metropolitan	Jan-08
D203	Blacktown Hospital	Major Metropolitan	Feb-08
C215	Sutherland Hospital	Major Metropolitan	Feb-08
C213	St George Hospital	Principal Referral Group A	Feb-08
A212	St Vincent's Hospital	Principal Referral Group A	Feb-08
D210	Nepean Hospital	Principal Referral Group B	Feb-08
L213	Lithgow	District Group 2	Feb-08
A201	Balmain	Sub Acute	Feb-08
B224	Ryde Hospital	Major Metropolitan	Mar-08
D224	Westmead Hospital	Principal Referral Group A	Mar-08
	Group B		
Q206	Maitland Hospital	Major Metropolitan	Jul-07
D210	Auburn Hospital	Major Metropolitan	Feb-08
D215	Campbelltown Hospital	Major Metropolitan	Feb-08
D225	Mt Druitt Hospital	Major Metropolitan	Mar-08
A237	Concord Hospital	Principal Referral Group A	Mar-08
D204	Blue Mountains Hospital	District Group 1	Mar-08

APPENDIX 2: AUDIT TOOL (V#3)

Eye Emergency Manual Project: Audit Sheet

Please refer to Audit Sheet Guidelines when completing the audit sheet.

Please identify whether each item has been recorded by placing an 'X' in the appropriate box with a BLACK PEN. Use BLOCK LETTERS to write the Provisional Diagnosis.



DATE: ___ / ___ / ___ SEEN BY: Reg GP Intern NP APN
 JMO CMO Emergency Physician RMO RN

HOSPITAL: Q214 Belmont Hospital

AGE RANGE: 0 - 4 5 - 13 14 - 64 65 + over

Triage Category 1 2 3 4 5
 Auditor's Triage Category 1 2 3 4 5

Hospital re-presentation Planned Unplanned Post operative

Provisional Diagnosis _____

History

Red Eye Yes No Affected Eye/ Both Eyes Yes No
 Painful Eye Yes No Ocular Trauma: Mechanism of Injury Yes No
 Visual Disturbance Yes No Time of Injury Yes No
 Contact Lens Yes No

Examination

External Eye/Lids Yes No Visual Acuity Yes No
 Pupil Exam Yes No Fluorescein Yes No
 Fundus Exam Yes No Slit Lamp Yes No
 Neurological Exam Yes No

ED Management

Urgent Ophthalmology Consultation Yes No
 IFYES - Telephone In person

Irrigation Yes No
 IFYES - < 10 min >10 min Unknown

Foreign body removal Yes No Were local anaesthetics instilled? Yes No
 Firm padding Yes No Were antibiotics given? Yes No
 Were analgesics given? Yes No Were antivirals given? Yes No
 Were steroids given? Yes No

Separation

Discharged home Admitted Transferred

Follow – up arranged (eg letter to Ophthalmologist, GP)

None GP Emergency Dept Ophthalmologist
 OPD Eye Clinic Other

APPENDIX 3: CHANGES TO AUDIT TOOL

Field	Field	Audit Form V#1	Audit Form V#2	Audit Form V#3
Hospital		√	√	√
Date		√	√	√
Seen By			added	changed
Age Range		√	√	√
Triage Category		√	√	√
Auditor's Triage Category		√	√	√
Hospital re-presentation		√	change	√
Provisional Diagnosis		√	√	√
History	Red Eye	√	√	√
History	Painful Eye	√	√	√
History	Visual Disturbance	√	√	√
History	Contact Lens		added	changed
History	Affected Eye/ Both eyes	√	√	√
History	Ocular Trauma: Mechanism of Injury	√	√	√
History	Ocular Trauma: Time of Injury	√	√	√
History	Other	√	removed	√
Examination	External Eye/ Lids	√	√	√
Examination	Pupil Exam	√	√	√
Examination	Fundus Exam	√	added	changed
Examination	Neurological Exam	√	added	changed
Examination	Visual Acuity	√	√	√
Examination	Fluorescein	√	√	√
Examination	Imaging	√	removed	
Examination	Pathology	√	removed	
Examination	Slit Lamp		added	√
ED Management	Asked for Ophthalmology Referral	√	removed	
ED Management	Urgent Ophthalmology Consultation	√	√	√
ED Management	Urgent Ophthalmology Consultation - method of contacting ophthalmologist		added	√
ED Management	Irrigation	√	√	√
ED Management	Irrigation - length of time irrigated		added	√
ED Management	Foreign Body Removal	√	√	√
ED Management	Firm padding	√	√	√
ED Management	Were analgesics given	√	√	√

Field	Field	Audit Form V#1	Audit Form V#2	Audit Form V#3
ED Management	Were steroids given	√	√	√
ED Management	Were local anaesthetics instilled		added	√
ED Management	Were antibiotics given	√	√	√
ED Management	Other	√	removed	
ED Management	Were antivirals given	√	√	√
Separation	Separation	√	√	√
Separation	Follow up arranged	√	√	√

APPENDIX 4: OPHTHALMOLOGY SURVEY

Aim: Examine the quality of referrals to ophthalmologists from emergency departments.

Plan: Random 5 minute telephone questionnaire survey of ophthalmologists

Repeat the survey with the same ophthalmologists in a few months time.

SURVEY: Explain that the survey refers only to patients referred from emergency departments.

1. Overall, how would you rate the quality of your referral information from emergency departments?

0 _____ 5
 Poor 1 2 3 4 Excellent
 History

2. Do you get an accurate history of current eye problem? Yes No

3. Do you get an accurate eye history? Yes No

4. Do you get an accurate, relevant medical / surgical history? Yes No

Assessment

5. Do you get an accurate description of the affected eye (red eye, painful eye, visual disturbance)?

Yes No

6. Do you get a visual acuity recording? Yes No

7. Are relevant pathology and radiology tests generally attended? Yes No

Treatment

8. Do you get documentation of all treatments commenced in the ED. (all drops instilled, analgesia, padding,

irrigation: type of fluid/time commenced/how much fluid)? Yes No

Diagnosis

9. Do you usually get a provisional diagnosis? Yes No

10. Are the provisional diagnoses usually correct? Yes No

Referral

11. Are the referrals appropriate? Yes No

12. Is the timing of the referrals appropriate given the level of urgency for the condition?

Yes No

How do you think the referral process from Emergency Departments could be improved?

APPENDIX 5: EYE EMERGENCY ASSESSMENT FORM

Treating Clinician: (Print Name) _____ Designation: _____ Date: _____ Time: _____

Presenting Problem: Include mechanism of injury / illness.

Past Medical History: Include previous relevant ocular & medical/surgical history

Allergies:	Medications:
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Social History: Work related injury; smoking / alcohol use

Eye Examination: Evert eyelids & pupil exam

Eye Irrigation: Chemical burns should receive copious irrigation for at least 30 mins or until pH is within normal limits

0.9% Normal Saline Hartmann's Solution N/A

Time irrigation commenced: _____ Amount instilled: _____ pH: _____

Visual Acuity:	[R] 6/	[L] 6/
Pin Hole / Corrected	[R] 6/	[L] 6/



Local anaesthetic: Yes No N/A

Fluorescein: Yes No N/A

Ophthalmoscope Exam:

Slit Lamp Examination:

Other Findings: i.e suspect head trauma

Provisional Diagnosis:

Management Plan: Include all investigations and results

Discharge: If eye pad / shield secured - instruct patient not to drive with eye padded.

Disposition: Discharged home Admit / Transfer : Ward / Hospital:

Follow-up: Please indicate the recommended time period for follow-up and referral to appropriate service:

< 24hrs 1-2 days 1 week Other:

Ophthalmologist OPD Eye Clinic LMO Emergency Department

None Other:

Treating Medical Officer (Signature):

Reviewed by Senior ED Medical Officer (print name):

Ophthalmology Registrar / Specialist (print name): Time of referral:

APPENDIX 6: EXAMPLES OF DIAGNOSIS GROUPING

Diagnostic Group	Diagnosis recorded
Acute red eye: painful	Iritis
	Episcleritis
	Endophthalmitis
Acute red eye: painful, cornea abnormal	Corneal abrasion
	Corneal ulcer
	Herpes ulcer
Acute red eye: painful, conjunctival injection	Conjunctivitis
	Subconjunctival haemorrhage
	Allergic reaction
Acute red eye: painful, eye lid abnormal	Blepharitis
	Stye
	Periorbital cellulitis
Trauma: other	Splash injury to eye
	Trauma to eyelid
	Injury to eye
Other	Eye Pain
	Red eye
	Dacrocystitis
Acute Visual Disturbance	Temporal arteritis
	Sudden loss of vision
	Vitreous detachment

APPENDIX 7: APPLICATION OF RECOMMENDED TRIAGE CATEGORIES BY AGE AND DIAGNOSIS

Triage by Age for T:Foreign Body

Age Range	ATS 1	ATS 2	ATS 3	ATS 4	ATS 5	Total	% Total Age Range recorded
0 - 4 years			3	3	1	7	1.65%
5- 13 years			5	5	4	14	3.29%
14 - 64 years		6	95	209	63	373	87.76%
65 years + over		2	8	21		31	7.29%
		8	111	238	68	425	

Triage by Age for ARE: Conjunctival injection

Age Range	ATS 1	ATS 2	ATS 3	ATS 4	ATS 5	Total	% Total Age Range recorded
0 - 4 years		1	6	28	21	56	16.18%
5- 13 years		1	7	14	4	26	7.51%
14 - 64 years	1	7	47	117	49	221	63.87%
65 years + over		1	10	28	4	43	12.43%
	1	10	70	187	78	346	

Triage by Age for ARE: Cornea Abnormal

Age Range	ATS 1	ATS 2	ATS 3	ATS 4	ATS 5	Total	% Total Age Range recorded
0 - 4 years		2	4	3	1	10	4.52%
5- 13 years		1	4	7	2	14	6.33%
14 - 64 years	1	15	54	83	25	178	80.54%
65 years + over			4	9	6	19	8.60%
	1	18	66	102	34	221	

Triage by Age for T: Chemical Burns

Age Range	ATS 1	ATS 2	ATS 3	ATS 4	ATS 5	Total	% Total Age Range recorded
0 - 4 years			4		1	5	7.25%
5- 13 years			1	1		2	2.90%
14 - 64 years	1	17	26	13	4	61	88.41%
65 years + over			1			1	1.45%
	1	17	32	14	5	69	

APPENDIX 8: CLINICIAN ENCOUNTERS BY DIAGNOSIS GROUPING

Diagnosis	JMO	CMO	Reg	GP	ED Phys	RN	NP	APN	Not recorded
Acute Red Eye, painful	43	20	11	8	5	8	2	1	11
Acute Red Eye, painful, cornea abnormal	77	55	40	3	11	4	9	1	17
Acute Red Eye, painful, diffuse conjunctival injection	156	71	43	15	18	10	3	2	48
Acute Red Eye, painful, eyelid abnormal	31	32	17	9	6	7	1	0	13
Acute Red Eye, painless, localised	3	4	3	0	1	0	0	0	0
Trauma, chemical burn	29	15	11	6	3	4	3	0	8
Trauma, corneal foreign body	45	36	21	1	6	1	5	0	8
Trauma, lid laceration	7	2	4	0	0	1	0	0	1
Trauma, blunt	22	19	17	3	2	2	1	1	8
Trauma, sharp penetrating	3	0	2	0	0	0	0	0	0
Trauma, other	20	13	2	2	3	0	2	0	3
Other	32	10	16	6	4	7	2	0	12
Not recorded	39	43	21	3	7	4	3	1	49
Acute Visual Disturbance	20	8	15	2	3	2	0	0	7
Trauma, foreign body, not corneal	116	71	37	14	15	8	8	1	35
Trauma burns, not chemical	18	8	10	2	2	2	1	0	6
	661	407	270	74	86	60	40	7	226

