

Consistency of Triage in Victoria's
Emergency Departments

Triage Consistency Report

July 2001

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Foreword

The Consistency of Triage in Victoria's Emergency Departments Project was funded by the Victorian Department of Human Services and conducted by the Monash Institute of Health Services Research during 2000-2001.

The project was overseen by a steering committee with representation from the Department of Human Services, the Australasian College for Emergency Medicine, the Emergency Nurses Association, the Australian Nursing Federation and Victorian hospitals and universities. The members of the steering committee were:

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The report detailing the project has been presented in five separate documents being:

The Literature Review;

The Triage Consistency Report;

The Education and Quality Report;

The Guidelines for Triage Education and Practice; and

The Summary Report.

This report is the second in the series and describes the research component of the project that explored the consistency of triage in Victoria's emergency departments.

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Terminology

ACEM	Australasian College for Emergency Medicine
ACN	Associate charge nurse
AMI	Acute myocardial infarction
APO	Acute pulmonary oedema
ATS	Australasian Triage Scale (formerly the National Triage Scale)
CNS	Clinical Nurse Specialist
COAD	Chronic obstructive airways disease
CVA	Cerebrovascular accident
DHS	Department of Human Services (Victoria)
DOA	Dead on arrival
ED	Emergency department
ENA	Emergency Nurses' Association of Victoria (Incorporated)
GCS	Glasgow Coma Scale
ICD10	International Classification of Diseases, 10 th Revision
NEC	Not elsewhere classified
NTS	National Triage Scale for Australasian Emergency Departments
NUM	Nurse Unit Manager
PV	Per vagina
RN	Registered nurse
SaO ₂	Oxygen saturation
URTI	Upper respiratory tract infection
UTI	Urinary track infection
VEMD	Victorian Emergency Minimum Dataset

1 Introduction

This stage of the project examined the consistency of triage in Victoria. In recent years, there have been a number of studies examining the consistency of triage, as explored in Report 1 – Literature Review. This project is the first state wide Victorian study using a multi-modal approach.

1.1 Objectives

The objectives for this stage of the project were to:

- Examine the Victorian Emergency Minimum Dataset (VEMD) to develop representative case scenarios;
- Examine aggregate VEMD data for admission rates by triage, top diagnoses by age group, diagnoses by triage category and diagnoses by age group by triage;
- Determine the representativeness of the sample studied to the VEMD;
- Determine representativeness of triage sample to emergency department attendance;
- Determine the degree of consistency in triage across emergency departments; and
- Examine the variance in agreement in triage categorisation.

1.2 Methods

To achieve these objectives, information was collected by a number of methods. These included:

- The collection and examination of VEMD data to identify trends in emergency department (ED) presentations across the state;
- The use of triage case scenarios (paper based and computer based) to collect information on the consistency of triage; and
- The use of real time paired dual triage to examine agreement in patient categorisation.

1.3 Recruitment & Ethical Considerations

1.3.1 Participating Hospitals

For the purposes of this portion of the project hospitals were aggregated according to hospital type. Group A1 (*teaching hospitals, large*), Group A2 (*teaching hospitals, other*) and Group B (*large regional and suburban hospitals*) is represented in Table 1.1.

Table 1.1. Group A1, A2 and B hospitals

Group A1 Hospitals	Group A2 Hospitals	Group B Hospitals
Austin & Repatriation Medical Centre (ARMC)	Barwon Health	Angliss Health Services
Monash Medical Centre, Clayton (MMC)	Box Hill Hospital	Ballarat Health Services
St. Vincent's Hospital	Dandenong Hospital	Bendigo Health Care Grp
Royal Children's Hospital (RCH)	Frankston Hospital	Echuca Regional Health
Royal Melbourne Hospital (RMH)	Mercy Hospital for Women	Goulburn Valley Health
The Alfred	Royal Victorian Eye & Ear Hospital (RVEEH)	Latrobe Regional Hospital (NLRH)
	Royal Women's Hospital (RWH)	Maroondah Hospital
	Sunshine Hospital	Mildura Base Hospital
	The Northern	South West Healthcare (Warrnambool)
	Werribee Mercy	Wangaratta Hospital
	Western Hospital	Williamstown Hospital
		Wimmera Health Care Group

1.3.2 Statewide recruitment of eligible triage nurses

All eligible ED Triage Nurses from the participating hospitals were sent a letter, describing the scenario completion and dual triage components of the project, inviting them to participate in the project (see Appendix 1). To ensure initial anonymity, the Nurse Unit Manager (NUM) from each ED facilitated the delivery of letters to each eligible triage nurse in their department. ED Triage Nurses willing to participate in the project were requested to respond to their invitation via a number of avenues such as an email or telephone call to the Project Coordinators or to return a letter of consent to the NUM. The replies from the ED triage nurses were grouped according to site and these lists were used as the sampling frame for the study. The sampling process for each component is described later in this report.

Only triage nurses who functioned independently in the role of triage were eligible for inclusion in the project. The project team, in consultation with ED NUMs made this decision. This meant that novice triage nurses who were undertaking supported practice shifts at triage or postgraduate students who were undergoing triage assessment were excluded from the project.

1.3.3 Ethical Considerations

The project team was cognisant of the potential for this project to cause anxiety both at individual and organisational levels. Strategies to minimise anxiety at individual and organisational levels included clear explanation of the aims of the project to all ED Triage Nurses and other key ED personnel. This explanation reiterated that the project did not aim to evaluate the performance of individual triage nurses or individual EDs. It was made clear that the focus of the project was consistency of triage. The determination of a “correct” triage category or the examination of triage clinical decision-making processes was beyond the aims of this study.

Assurance was given to all ED Triage Nurses and other key ED personnel that data collected was confidential and would be presented in aggregate form only so as to protect the identity of individuals.

1.3.3.1 Details for handling any adverse events

During the “dual triage” stage of the project, the Project Triage Nurse participated in the triage process purely as an observer and did not interact with the patient in any way. If an unforeseen situation arose such as a patient experiencing an adverse event or a change in health status while waiting care, the Project Triage Nurse was instructed to notify the Nurse Unit Manager or the registered nurse in charge of the shift. Fortunately there were no adverse events of this nature during the course of this project.

2 VEMD Data

VEMD aggregate data for the period from October 1999 to March 2000 were obtained from the Department of Human Services (DHS). These time frames were selected as they correlated with the time frame of the project but in the previous year. This data was then examined to determine

Admission rates by triage category;

Diagnoses by triage category;

Departure status by triage category;

Diagnoses by age group (paediatric [<16 yrs] and adult [≥ 16 yrs]) by triage; and

Footprints for major presenting conditions.

The VEMD data was also used to establish the most frequent presenting diagnoses to assist in the development of case scenarios and to determine that the study sample was representative of emergency department attendance.

The data collected included:

1. Patient age;
2. Patient gender;
3. Date and time of presentation;
4. Triage category;
5. ED discharge diagnosis (ICD-10); and
6. Hospital campus code.

2.1 Data analysis

2.1.1 Distribution of triage categories

VEMD data from October 1999 - March 2000 was examined for the distribution of triage categories and the most common presentations for each triage category. The most common presentations were then further examined to determine the most frequent presentations for all patients, adult patients and paediatric patients. For the purposes of this analysis, a paediatric presentation was defined as presentation by a patient under, but not including the age of 16 years and an adult presentation was defined as the presentation of a patient whose age was equal to or over the age of sixteen years. Table 2.1 displays the definitions for the triage categories. It should be noted that for the timeframe of the data analysis the National Triage Scale (NTS) was in use. However, the NTS has since been updated and renamed the Australasian Triage Scale (ATS). The major difference between the two scales is the definition for each category. The treatment acuity remains unchanged.

Table 2.1. National Triage Scale for Australasian Emergency Departments

Numeric Code (where used)	Categories	Treatment Acuity
1	Resuscitation	Immediate
2	Emergency	Minutes (< 10 minutes)
3	Urgent	Half Hour
4	Semi Urgent	One Hour
5	Non Urgent	Two Hours
6	Dead on Arrival	N/A

There were a total of 362,623 presentations during the data period. Of these, 276,648 (76.9%) were adult presentations and 85,961 (23.1%) were paediatric presentations. The data was examined to determine the distribution of the six triage categories for all presentations, adult only and paediatric only and is displayed in Table 2.2.

Table 2.2. ED presentations by triage category and population

Triage Category	All Presentations		Adult Presentations		Paediatric Presentations	
1	3,080	0.8%	2,831	1.0%	249	0.3%
2	19,560	5.4%	17,030	6.2%	2,530	2.9%
3	88,506	24.4%	68,826	24.9%	19,675	22.9%
4	169,366	46.7%	125,218	45.3%	44,142	51.4%
5	81,377	22.4%	62,025	22.4%	19,349	22.5%
6	734	0.2%	718	0.3%	16	0.0%
Total	362,623	100.0%	276,648	100.0%	85,961	100.0%

2.1.2 Distribution of diagnoses by triage category

The data from each triage category was examined to determine the most common ED discharge diagnoses. This data was examined in relation to all adult and paediatric ED presentations, although limited to the ten most common ED discharge diagnoses.

2.1.2.1 Triage Category 1

There were 3,080 (0.8%) patients in Triage Category 1 during the period examined. Of these, 2,831 (92%) were adult presentations and 249 (8%) were paediatric presentations. Table 2.3, Table 2.4 and Table 2.5 display the frequency distribution of the most common ED discharge diagnoses in Triage Category 1, overall, for adults only and for paediatrics only.

Table 2.3. ED discharge diagnoses for Triage Category 1

ED Discharge Diagnosis	ICD10	n	%
Cardiac arrest	I469	260	8.4
Injury > 1 region	T07	244	7.9
APO	J81	189	6.1
AMI	I219	140	4.5
Asthma	J459	110	3.6
Head injury	S069	102	3.3
Heroin poisoning	T401	96	3.1
COAD	J449	59	1.9
Intracerebral haemorrhage (without	I619	56	1.8
Toxic effect	T659	55	1.8

Table 2.4. Adult ED discharge diagnoses for Triage Category 1

ED Discharge Diagnosis	ICD10	n	%
Cardiac arrest	I469	255	9.0
Injury > 1 region	T07	235	8.3
APO	J81	188	6.6
AMI	I219	140	4.9
Asthma	J459	109	3.9
Heroin poisoning	T401	96	3.4
Head injury	S069	85	3.0
COAD	J449	59	2.1
Intracerebral haemorrhage (without	I619	56	2.0
CVA	T659	51	1.8

Table 2.5. Paediatric ED discharge diagnoses for Triage Category 1

ED Discharge Diagnosis	ICD10	n	%
Febrile convulsion	R560	24	9.6
Croup	J050	22	8.8
Head injury	S069	17	6.8
Epileptic convulsion	G409	15	6.0
Status epilepticus	G419	14	5.6
Drowning	T751	9	3.6
Injury > 1 region	T07	9	3.6
Afebrile convulsion	R568	8	3.2
Childhood asthma	J450	7	2.8
Grand mal epilepsy	G406	5	2.0

2.1.2.2 Triage Category 2

There were 19,560 (5.4%) patients in Triage Category 2 during the period examined. Of these, 17,030 (87%) were adult presentations and 2,530 (13%) were paediatric presentations. Table 2.6, Table 2.7 and Table 2.8 display the frequency distribution of the most common ED discharge diagnoses in Triage Category 2, overall, for adults only and for paediatrics only.

Table 2.6. ED discharge diagnoses for Triage Category 2

ED Discharge Diagnosis	ICD10	n	%
Chest pain (NEC)	R074	2544	13.0
Unstable angina	I200	2059	10.5
AMI	I219	727	3.7
Childhood asthma	J459	620	3.2
Atrial fibrillation / flutter	I48	394	2.0
Angina (not unstable)	I209	388	2.0
Asthma	J450	352	1.8
APO	J81	336	1.7
COAD	J449	336	1.7
Collapse	R55	312	1.6

Table 2.7. Adult ED discharge diagnoses for Triage Category 2

ED Discharge Diagnosis	ICD10	n	%
Chest pain (NEC)	R074	2544	14.9
Unstable angina	I200	2059	12.1
AMI	I219	727	4.3
Asthma	J459	564	3.3
Atrial fibrillation / flutter	I48	392	2.3
Angina (not unstable)	I209	388	2.3
APO	J81	336	2.0
COAD	J449	336	2.0
Collapse	R55	307	1.8
Arrhythmia	I499	282	1.7

Table 2.8. Paediatric ED discharge diagnoses for Triage Category 2

ED Discharge Diagnosis	ICD10	n	%
Childhood asthma	J450	329	13.0
Croup	J050	226	8.9
Head injury	S069	73	2.9
Toxic effect	T659	73	2.9
Febrile convulsion	R560	70	2.8
Fractured forearm	S529	69	2.7
Asthma	J459	56	2.2
Viral infection	B349	49	1.9
No disease found	R69	46	1.8
Afebrile convulsion	R568	45	1.8

2.1.2.3 Triage Category 3

There were 88,501 (24.4%) patients in Triage Category 3 during the period examined. Of these, 68,826 (78%) were adult presentations and 19,675 (22%) were paediatric presentations. Table 2.9, Table 2.10 and Table 2.11 display the frequency distribution of the most common ED discharge diagnoses in Triage Category 3, overall, for adults only and for paediatrics only.

Table 2.9. ED discharge diagnoses for Triage Category 3

ED Discharge Diagnosis	ICD10	n	%
Chest pain (NEC)	R074	4145	4.7
Abdominal colic	R104	2941	3.3
Asthma	J450	2127	2.4
Unstable angina	I200	1975	2.2
Collapse	R55	1680	1.9
Childhood asthma	J450	1683	1.9
Renal colic	N23	1560	1.8
Viral infection	B349	1507	1.7
Infectious diarrhoea	A09	1376	1.6
Croup	J050	1148	1.3

Table 2.10. Adult ED discharge diagnoses for Triage Category 3

ED Discharge Diagnosis	ICD10	n	%
Chest pain (NEC)	R074	4095	5.9
Abdominal colic	R104	2474	3.6
Unstable angina	I200	1975	2.9
Asthma	J459	1747	2.5
Collapse	R55	1604	2.3
Renal colic	N23	1555	2.3
COAD	J449	954	1.4
Pneumonia (lobar)	J181	907	1.3
Migraine	G439	817	1.2
CVA	I64	820	1.2

Table 2.11. Paediatric ED discharge diagnoses for Triage Category 3

ED Discharge Diagnosis	ICD10	n	%
Childhood asthma	J450	1623	8.2
Croup	J050	1144	5.8
Viral infection	B349	1111	5.6
Infectious diarrhoea	A09	770	3.9
Fractured forearm	S529	542	2.8
Abdominal colic	R104	467	2.4
URTI	J069	455	2.3
Fractured wrist / hand	S628	412	2.2
Pyrexia of unknown origin	R509	408	2.1
Febrile convulsion	R560	383	1.9

2.1.2.4 Triage Category 4

There were 169,366 (46.7%) patients in Triage Category 4 during the period examined. Of these, 125,218 (73%) were adult presentations and 44,142 (27%) were paediatric presentations. Table 2.12, Table 2.13 and Table 2.14 display the frequency distribution of the most common ED discharge diagnoses in Triage Category 4, overall, for adults only and for paediatrics only.

Table 2.12. ED discharge diagnoses for Triage Category 4

ED Discharge Diagnosis	ICD10	n	%
Missing (discharge diagnoses)	*	9039	5.3
Abdominal colic	R104	6628	3.9
Viral infection	B349	4293	2.5
Infectious diarrhoea	A09	4219	2.5
Wound / bite to hand	S619	4144	2.4
Review	Z099	3121	1.8
Wound to face	S0180	3005	1.8
UTI	N390	2856	1.7
Fractured hand / wrist	S628	2722	1.6
No disease found	R69	2676	1.6
Cellulitis	L039	2497	1.5

Table 2.13. Adult ED discharge diagnoses for Triage Category 4

ED Discharge Diagnosis	ICD10	n	%
Missing (discharge diagnosis)	*	6334	5.1
Abdominal colic	R104	5202	4.2
Wound / bite to hand	S619	3509	2.8
Review	Z099	2308	1.8
UTI	N390	2222	1.8
Cellulitis	L039	2159	1.7
Infectious diarrhoea	A09	1843	1.5
Fractured hand / wrist	S628	1825	1.5
No disease found	R69	1809	1.4
Sprain / strain ankle	S9340	1755	1.4
Wound to face	S0180	1587	1.3

Table 2.14. Paediatric ED discharge diagnoses for Triage Category 4

ED Discharge Diagnosis	ICD10	n	%
Viral infection	B349	3229	7.3
Missing (discharge diagnosis)	*	2700	6.1
Infectious diarrhoea	A09	2376	5.4
Abdominal colic	R104	1426	3.2
Wound to face	S0180	1418	3.2
URTI	J069	1412	3.2
Croup	J050	1128	2.6
Otitis media	H669	1094	2.5
Fractured wrist / hand	S628	897	2.0
No disease found	R69	867	2.0
Review	Z099	813	1.8

2.1.2.5 Triage Category 5

There were 81,377 (22.4%) patients in Triage Category 5 during the period examined. Of these, 62,025 (77%) were adult presentations and 19,349 (23%) were paediatric presentations. Table 2.15, Table 2.16 and Table 2.17 display the frequency distribution of the most common ED discharge diagnoses in Triage Category 5, overall, for adults only and for paediatrics only.

Table 2.15. ED discharge diagnoses for Triage Category 5

ED Discharge Diagnosis	ICD10	n	%
Review	Z099	8031	9.9
Missing (discharge diagnosis)	*	4933	6.1
Inflammatory eye disorder	H578	3716	4.6
Removal of sutures	Z480	2715	3.3
Plaster change / check	Z478	2016	2.5
Otitis media	H609	1742	2.1
Foreign body – eye	T159	1612	2.0
Eye injury	S059	1469	1.8
Ear disorder	H938	1374	1.7
Wound / bite to hand	S619	1345	1.7
Viral infection	B349	1298	1.6
Threatened abortion	O200	1119	1.4

Table 2.16. Adult ED discharge diagnoses for Triage Category 5

ED Discharge Diagnosis	ICD10	n	%
Review	Z099	6269	10.1
Missing (discharge diagnosis)	*	3589	5.8
Inflammatory eye disorder	H578	3454	5.6
Removal of sutures	Z480	2276	3.7
Otitis media	H609	1535	2.5
Foreign body – eye	T159	1528	2.5
Eye injury	S059	1315	2.1
Ear disorder	H938	1252	2.0
Wound / bite to hand	S619	1144	1.8
Threatened abortion	O200	1117	1.8
Plaster change / check	Z478	1063	1.7

Table 2.17. Paediatric ED discharge diagnoses for Triage Category 5

ED Discharge Diagnosis	ICD10	n	%
Review	Z099	1762	9.1
Missing (discharge diagnosis)	*	1341	6.9
Viral infection	B349	999	5.2
Plaster change / check	Z478	953	4.9
URTI	J069	618	3.2
Infectious diarrhoea	A09	590	3.0
Otitis media	H669	565	2.9
Wound to face	S0180	446	2.3
Removal of sutures	Z480	439	2.3
No disease found	R69	406	2.1
Tonsillitis (acute)	J039	288	1.5

2.1.3 Distribution of triage categories by hospital site

Table 2.18 provides an overview of ED presentations by triage category for each participating hospital.

Table 2.18. ED presentations by triage category and hospital

Hospital	Category 1		Category 2		Category 3		Category 4		Category 5		Category 6		Total	
The Alfred	443	2.9%	1,581	10.3%	4,535	29.5%	6,586	42.8%	1,907	12.4%	321	2.1%	15,373	4.2%
Bendigo	40	.3%	449	3.2%	2,328	16.7%	6,673	48.0%	4,416	31.8%	1	.0%	13,907	3.8%
ARMC	169	1.2%	1,154	8.0%	4,945	34.0%	7,573	52.2%	673	4.6%	1	.0%	14,504	4.0%
Box Hill Hospital	189	1.3%	638	4.5%	4,953	35.1%	7,683	54.5%	614	4.4%	16	.1%	14,093	3.9%
Goulburn (Shep)	38	.4%	562	5.5%	2,833	27.5%	4,846	47.1%	2,002	19.5%	12	.1%	10,293	2.8%
Wangaratta	13	.2%	85	1.2%	1,933	16.3%	2,012	27.4%	4,021	54.8%	9	.1%	7,339	2.0%
Mercy Public	2	.1%	14	.4%	32	.8%	106	2.7%	3,755	96.1%			3,909	1.1%
Monash Medical Centre	369	1.8%	2,324	11.5%	6,828	33.9%	8,782	43.6%	1,839	9.1%	2	.0%	20,144	5.6%
Western Hospital	256	1.6%	1,523	9.6%	4,987	31.5%	7,716	48.7%	1,308	8.2%	66	.4%	15,856	4.4%
Royal Children's Hospital	42	.2%	318	1.6%	4,333	21.4%	10,164	50.2%	5,389	26.6%	6	.0%	20,252	5.6%
Maroondah Hospital	82	.7%	557	4.5%	2,924	23.8%	7,635	62.2%	1,029	8.4%	46	.4%	12,273	3.4%
Royal Women's Hospital	3	.0%	23	.2%	406	4.1%	2,295	23.4%	7,098	72.2%			9,825	2.7%
Royal Victorian Eye & Ear			12	.1%	125	.8%	819	5.2%	14,728	93.9%			15,684	4.3%
The Northern Hospital	124	.7%	680	3.9%	4,303	24.6%	9,052	51.7%	3,354	19.2%	1	.0%	17,514	4.8%
Mercy (Werribee)	29	.3%	460	4.3%	2,255	21.3%	6,951	65.7%	830	7.8%	60	.6%	10,585	2.9%
Royal Melbourne Hospital	301	1.6%	1,866	9.8%	5,916	31.2%	9,584	50.6%	1,219	6.4%	69	.4%	18,955	5.2%
Sunshine Hospital	27	.3%	201	2.0%	1,484	14.8%	4,921	49.1%	3,386	33.8%			10,019	2.8%
St Vincent's Hospital	177	1.5%	820	6.7%	3,929	32.2%	6,171	50.7%	1,086	8.9%			12,183	3.4%
Williamstown Hospital	2	.0%	39	.6%	727	11.7%	3,549	56.9%	1,918	30.8%			6,235	1.7%
Angliss Health Service	27	.2%	622	5.0%	2,666	21.5%	6,974	56.3%	2,092	16.9%	9	.1%	12,390	3.4%
Ballarat	66	.5%	372	3.0%	2,508	20.3%	7,894	63.8%	1,501	12.1%	26	.2%	12,367	3.4%
Barwon Health	138	.9%	1,243	7.8%	4,850	30.6%	9,282	58.5%	328	2.1%	22	.1%	15,863	4.4%
Dandenong Hospital	289	1.7%	1,561	9.4%	6,102	36.7%	6,908	41.5%	1,787	10.7%	1	.0%	16,648	4.6%
Warrnambool	21	.2%	142	1.7%	1,631	19.0%	3,819	44.5%	2,965	34.6%			8,578	2.4%
Wimmera Health	14	.3%	166	3.4%	942	19.5%	2,507	51.8%	1,207	24.9%	6	.1%	4,842	1.3%
Echuca	11	.2%	116	2.0%	561	9.8%	2,303	40.1%	2,743	47.8%	6	.1%	5,740	1.6%
Frankston	102	.7%	810	5.5%	6,550	44.5%	7,028	47.7%	195	1.3%	48	.3%	14,733	4.1%
NLRH	72	.6%	647	5.8%	1,963	17.5%	5,870	52.4%	2,644	23.6%			11,196	3.1%
Mildura Base Hospital	34	.3%	575	5.1%	1,702	15.0%	3,663	32.4%	5,343	47.2%	6	.1%	11,323	3.1%
Total	3,080	.8%	19,560	5.4%	88,506	24.4%	169,36	46.7%	81,377	22.4%	734	.2%	362,62	100.0%

2.1.4 Distribution of triage categories by departure status

Table 2.19 to Table 2.25 summarise the findings of the analysis of the VEMD data to identify the frequency distribution of triage category by departure status and the percentage of total ED presentations for each participating hospital

Table 2.19. ED presentations “discharged home” by triage category and percentage of total presentations by hospital

Hospital	Category 1		Category 2		Category 3		Category 4		Category 5		Category 6		Total	
The Alfred	31	7.0%	640	40.5%	2592	57.2%	4389	66.6%	1343	70.4%	1	.3%	8996	58.5%
Bendigo	4	10.0%	148	33.0%	1287	55.3%	4996	74.9%	3881	87.9%			10316	74.2%
Austin & Repat	12	7.1%	420	36.4%	2723	55.2%	5127	67.7%	552	82.0%			8834	60.9%
Box Hill	15	7.9%	218	34.2%	2691	54.3%	5372	69.9%	492	80.1%			8788	62.4%
Goulburn (Shep)	1	2.6%	160	28.5%	1348	47.6%	3714	76.6%	1479	73.9%	1	8.3%	6703	65.1%
Wangaratta			19	22.4%	486	40.5%	1428	71.0%	3652	90.8%			5585	76.1%
Mercy Public	1	50.0%	1	7.1%	8	25.0%	21	19.8%	2585	68.8%			2616	66.9%
MMC	50	13.6%	988	42.5%	4048	59.3%	5920	67.4%	1372	74.6%			12378	61.4%
Western	27	10.5%	548	36.0%	2887	57.9%	5775	74.8%	1080	82.6%			10317	65.1%
RCH	4	9.5%	63	19.8%	2441	56.3%	8330	82.0%	4677	86.8%			15515	76.6%
Maroondah	8	9.8%	239	42.9%	1944	66.5%	5761	75.5%	875	85.0%			8827	71.9%
RWH			2	8.7%	43	10.6%	799	34.8%	6143	86.5%			6987	71.1%
RVEEH			4	33.3%	68	54.4%	584	71.3%	13630	92.5%			14286	91.1%
Northern	14	11.3%	249	36.6%	2808	65.3%	6901	76.2%	2439	72.7%			12411	70.9%
Mercy (Werribee)	3	10.3%	252	54.8%	1656	73.4%	6108	87.9%	665	80.1%			8684	82.0%
RMH	34	11.3%	793	42.5%	3731	63.1%	7311	76.3%	1046	85.8%			12915	68.1%
Sunshine	4	14.8%	64	31.8%	953	64.2%	4151	84.4%	3135	92.6%			8307	82.9%
ST V's	59	33.3%	426	52.0%	2424	61.7%	4432	71.8%	747	68.8%			8088	66.4%
Williamstown			18	46.2%	508	69.9%	3121	87.9%	1798	93.7%			5445	87.3%
Angliss	3	11.1%	338	54.3%	1860	69.8%	5594	80.2%	1780	85.1%			9575	77.3%
Ballarat	3	4.5%	110	29.6%	1376	54.9%	6643	84.2%	1376	91.7%			9508	76.9%
Barwon Health	10	7.2%	351	28.2%	2425	50.0%	6600	71.1%	235	71.6%			9621	60.7%
Dandenong	60	20.8%	764	48.9%	4070	66.7%	4756	68.8%	1405	78.6%			11055	66.4%
Warrnambool			34	23.9%	727	44.6%	2939	77.0%	2799	94.4%			6499	75.8%
Wimmera Health			26	15.7%	413	43.8%	2085	83.2%	1129	93.5%			3653	75.4%
Echuca			39	33.6%	297	52.9%	1813	78.7%	2457	89.6%			4606	80.2%
Frankston	11	10.8%	267	33.0%	3727	56.9%	4421	62.9%	147	75.4%			8573	58.2%
NLRH	5	6.9%	289	44.7%	1271	64.7%	4969	84.7%	2425	91.7%			8959	80.0%
Mildura Base Hospital	6	17.6%	266	46.3%	1122	65.9%	3128	85.4%	5032	94.2%			9554	84.4%

Table 2.20. ED presentations "admitted to the ward" by triage category and percentage of total presentations by hospital

Hospital	Category 1		Category 2		Category 3		Category 4		Category 5		Category 6		Total	
The Alfred	344	77.7%	715	45.2%	1374	30.3%	1045	15.9%	81	4.2%	1	.3%	3560	23.2%
Bendigo	30	75.0%	288	64.1%	988	42.4%	1343	20.1%	157	3.6%			2806	20.2%
Austin & Repat	127	75.1%	667	57.8%	1970	39.9%	1643	21.7%	31	4.6%			4438	30.6%
Box Hill	127	67.2%	369	57.8%	2010	40.6%	1470	19.1%	27	4.4%			4003	28.4%
Goulburn (Shep)	26	68.4%	376	66.9%	1338	47.2%	774	16.0%	293	14.6%			2807	27.3%
Wangaratta	5	38.5%	63	74.1%	675	56.3%	503	25.0%	103	2.6%			1349	18.4%
Mercy Public			12	85.7%	22	68.8%	84	79.2%	1080	28.8%			1198	30.6%
MMC	218	59.1%	996	42.9%	1995	29.2%	1421	16.2%	144	7.8%			4774	23.7%
Western	181	70.7%	894	58.7%	1860	37.3%	1423	18.4%	99	7.6%			4457	28.1%
RCH	33	78.6%	251	78.9%	1868	43.1%	1169	11.5%	138	2.6%			3459	17.1%
Maroondah	40	48.8%	208	37.3%	667	22.8%	970	12.7%	49	4.8%			1934	15.8%
RWH	1	33.3%	19	82.6%	349	86.0%	1465	63.8%	849	12.0%			2683	27.3%
RVEEH			7	58.3%	53	42.4%	225	27.5%	241	1.6%			526	3.4%
Northern	87	70.2%	392	57.6%	1363	31.7%	1393	15.4%	187	5.6%			3422	19.5%
Mercy (Werribee)	5	17.2%	74	16.1%	375	16.6%	304	4.4%	2	.2%			760	7.2%
RMH	229	76.1%	936	50.2%	1880	31.8%	1845	19.3%	65	5.3%			4955	26.1%
Sunshine	7	25.9%	91	45.3%	472	31.8%	597	12.1%	108	3.2%			1275	12.7%
ST V's	92	52.0%	281	34.3%	1161	29.5%	902	14.6%	59	5.4%			2495	20.5%
Williamstown	1	50.0%	11	28.2%	170	23.4%	301	8.5%	62	3.2%			545	8.7%
Angliss	7	25.9%	216	34.7%	631	23.7%	728	10.4%	85	4.1%			1667	13.5%
Ballarat	51	77.3%	250	67.2%	1064	42.4%	951	12.0%	39	2.6%			2355	19.0%
Barwon Health	105	76.1%	842	67.7%	2237	46.1%	1811	19.5%	18	5.5%			5013	31.6%
Dandenong	171	59.2%	675	43.2%	1602	26.3%	1086	15.7%	120	6.7%			3654	21.9%
Warrnambool	21	100.0%	107	75.4%	877	53.8%	773	20.2%	80	2.7%			1858	21.7%
Wimmera Health	12	85.7%	135	81.3%	498	52.9%	389	15.5%	37	3.1%			1071	22.1%
Echuca	5	45.5%	58	50.0%	234	41.7%	416	18.1%	174	6.3%			887	15.5%
Frankston	51	50.0%	387	47.8%	2040	31.1%	1665	23.7%	13	6.7%			4156	28.2%
NLRH	52	72.2%	331	51.2%	633	32.2%	675	11.5%	109	4.1%			1800	16.1%
Mildura Base Hospital	16	47.1%	269	46.8%	496	29.1%	425	11.6%	122	2.3%			1328	11.7%

Table 2.21. ED presentations "transferred out" by triage category and percentage of total presentations by hospital

Hospital	Category 1		Category 2		Category 3		Category 4		Category 5		Category 6		Total	
The Alfred	31	7.0%	182	11.5%	387	8.5%	340	5.2%	19	1.0%			959	6.2%
Bendigo	4	10.0%	13	2.9%	30	1.3%	43	.6%	2	.0%			92	.7%
Austin & Repat	13	7.7%	54	4.7%	128	2.6%	85	1.1%	1	.1%			281	1.9%
Box Hill	26	13.8%	39	6.1%	160	3.2%	92	1.2%					317	2.2%
Goulburn (Shep)	6	15.8%	18	3.2%	72	2.5%	34	.7%	2	.1%			132	1.3%
Wangaratta			2	2.4%	23	1.9%	16	.8%	3	.1%			44	.6%
Mercy Public	1	50.0%	1	7.1%	2	6.3%	1	.9%	19	.5%			24	.6%
MMC	69	18.7%	319	13.7%	594	8.7%	432	4.9%	34	1.8%			1448	7.2%
Western	19	7.4%	54	3.5%	118	2.4%	75	1.0%	6	.5%			272	1.7%
RCH	1	2.4%	3	.9%	8	.2%	13	.1%	2	.0%			27	.1%
Maroondah	18	22.0%	99	17.8%	251	8.6%	235	3.1%	7	.7%			610	5.0%
RWH	2	66.7%	2	8.7%	13	3.2%	25	1.1%	37	.5%			79	.8%
RVEEH			1	8.3%	3	2.4%	7	.9%	11	.1%			22	.1%
Northern	11	8.9%	30	4.4%	71	1.7%	51	.6%	10	.3%			173	1.0%
Mercy (Werribee)	17	58.6%	129	28.0%	193	8.6%	85	1.2%	2	.2%			426	4.0%
RMH	20	6.6%	109	5.8%	210	3.5%	135	1.4%	4	.3%			478	2.5%
Sunshine	14	51.9%	42	20.9%	47	3.2%	32	.7%	6	.2%			141	1.4%
ST V's	6	3.4%	91	11.1%	184	4.7%	123	2.0%	6	.6%			410	3.4%
Williamstown	1	50.0%	10	25.6%	41	5.6%	51	1.4%	15	.8%			118	1.9%
Angliss	13	48.1%	59	9.5%	142	5.3%	127	1.8%	9	.4%			350	2.8%
Ballarat	7	10.6%	5	1.3%	27	1.1%	32	.4%	1	.1%			72	.6%
Barwon Health	16	11.6%	43	3.5%	95	2.0%	64	.7%					218	1.4%
Dandenong	35	12.1%	89	5.7%	174	2.9%	112	1.6%	10	.6%			420	2.5%
Warrnambool					12	.7%	20	.5%	4	.1%			36	.4%
Wimmera Health			5	3.0%	20	2.1%	5	.2%					30	.6%
Echuca	4	36.4%	19	16.4%	27	4.8%	31	1.3%	7	.3%			88	1.5%
Frankston	22	21.6%	140	17.3%	599	9.1%	288	4.1%	6	3.1%			1055	7.2%
NLRH	10	13.9%	17	2.6%	37	1.9%	25	.4%	1	.0%			90	.8%
Mildura Base Hospital	2	5.9%	30	5.2%	50	2.9%	29	.8%	13	.2%			124	1.1%

Table 2.22. ED presentations "left at own risk" by triage category and percentage of total presentations by hospital

Hospital	Category 1		Category 2		Category 3		Category 4		Category 5		Category 6	Total	
The Alfred	3	.7%	19	1.2%	88	1.9%	160	2.4%	41	2.1%		311	2.0%
Bendigo					5	.2%	12	.2%	1	.0%		18	.1%
Austin & Repat	2	1.2%	8	.7%	55	1.1%	46	.6%	2	.3%		113	.8%
Box Hill	1	.5%	8	1.3%	40	.8%	32	.4%	3	.5%		84	.6%
Goulburn (Shep)	1	2.6%	7	1.2%	41	1.4%	34	.7%	8	.4%		91	.9%
Wangaratta			1	1.2%	10	.8%	16	.8%	11	.3%		38	.5%
Mercy Public									3	.1%		3	.1%
MMC	3	.8%	17	.7%	63	.9%	55	.6%	8	.4%		146	.7%
Western	10	3.9%	21	1.4%	92	1.8%	107	1.4%	10	.8%		240	1.5%
RCH					3	.1%	7	.1%	2	.0%		12	.1%
Maroondah	1	1.2%	9	1.6%	48	1.6%	71	.9%	4	.4%		133	1.1%
RWH							2	.1%	1	.0%		3	.0%
RVEEH									2	.0%		2	.0%
Northern			6	.9%	37	.9%	53	.6%	17	.5%		113	.6%
Mercy (Werribee)	1	3.4%	3	.7%	14	.6%	26	.4%	1	.1%		45	.4%
RMH	3	1.0%	20	1.1%	73	1.2%	147	1.5%	39	3.2%		282	1.5%
Sunshine	2	7.4%	3	1.5%	4	.3%	18	.4%	5	.1%		32	.3%
ST V's	7	4.0%	17	2.1%	99	2.5%	105	1.7%	10	.9%		238	2.0%
Williamstown					6	.8%	15	.4%	5	.3%		26	.4%
Angliss	2	7.4%	6	1.0%	20	.8%	18	.3%	2	.1%		48	.4%
Ballarat	1	1.5%	6	1.6%	34	1.4%	32	.4%	7	.5%		80	.6%
Barwon Health			6	.5%	43	.9%	63	.7%	3	.9%		115	.7%
Dandenong	8	2.8%	19	1.2%	76	1.2%	68	1.0%	9	.5%		180	1.1%
Warrnambool			1	.7%	10	.6%	14	.4%	6	.2%		31	.4%
Wimmera Health					10	1.1%	4	.2%				14	.3%
Echuca													
Frankston	2	2.0%	8	1.0%	110	1.7%	116	1.7%	6	3.1%		242	1.6%
NLRH			7	1.1%	16	.8%	27	.5%	2	.1%		52	.5%
Mildura Base Hospital			8	1.4%	31	1.8%	36	1.0%	43	.8%		118	1.0%

Table 2.23. ED presentations "left before being seen" by triage category and percentage of total presentations by hospital

Hospital	Category 1		Category 2		Category 3		Category 4		Category 5		Category 6		Total	
The Alfred	2	.5%	16	1.0%	86	1.9%	617	9.4%	410	21.5%	2	.6%	1133	7.4%
Bendigo					17	.7%	279	4.2%	375	8.5%			671	4.8%
Austin & Repat			2	.2%	57	1.2%	671	8.9%	87	12.9%			817	5.6%
Box Hill					47	.9%	714	9.3%	92	15.0%			853	6.1%
Goulburn (Shep)			1	.2%	34	1.2%	290	6.0%	218	10.9%			543	5.3%
Wangaratta					4	.3%	48	2.4%	252	6.3%			304	4.1%
Mercy Public									68	1.8%			68	1.7%
MMC			2	.1%	126	1.8%	953	10.9%	281	15.3%			1362	6.8%
Western			2	.1%	28	.6%	336	4.4%	113	8.6%			479	3.0%
RCH			1	.3%	13	.3%	645	6.3%	570	10.6%			1229	6.1%
Maroondah			1	.2%	10	.3%	596	7.8%	94	9.1%			701	5.7%
RWH					1	.2%	4	.2%	68	1.0%			73	.7%
RVEEH					1	.8%	3	.4%	844	5.7%			848	5.4%
Northern			2	.3%	22	.5%	653	7.2%	700	20.9%			1377	7.9%
Mercy (Werribee)			1	.2%	17	.8%	428	6.2%	160	19.3%			606	5.7%
RMH			1	.1%	17	.3%	145	1.5%	65	5.3%			228	1.2%
Sunshine			1	.5%	8	.5%	123	2.5%	132	3.9%			264	2.6%
ST V's			2	.2%	58	1.5%	609	9.9%	264	24.3%			933	7.7%
Williamstown					2	.3%	60	1.7%	38	2.0%			100	1.6%
Angliss					12	.5%	507	7.3%	216	10.3%			735	5.9%
Ballarat					7	.3%	235	3.0%	78	5.2%			320	2.6%
Barwon Health			1	.1%	50	1.0%	743	8.0%	72	22.0%			866	5.5%
Dandenong	1	.3%	9	.6%	177	2.9%	884	12.8%	242	13.5%			1313	7.9%
Warrnambool					5	.3%	73	1.9%	76	2.6%			154	1.8%
Wimmera Health					1	.1%	24	1.0%	41	3.4%			66	1.4%
Echuca					3	.5%	43	1.9%	105	3.8%			151	2.6%
Frankston					70	1.1%	536	7.6%	23	11.8%			629	4.3%
NLRH			1	.2%	6	.3%	174	3.0%	107	4.0%			288	2.6%
Mildura Base Hospital					3	.2%	45	1.2%	127	2.4%			175	1.5%

Table 2.24. ED presentations “died in ED” by triage category and percentage of total presentations by hospital

Hospital	Category 1		Category 2		Category 3		Category 4		Category 5		Category 6		Total	
The Alfred	30	6.8%	7	.4%	6	.1%	33	.5%	11	.6%			87	.6%
Bendigo	2	5.0%			1	.0%							3	.0%
Austin & Repat	15	8.9%	3	.3%	1	.0%	1	.0%					20	.1%
Box Hill	20	10.6%	4	.6%	5	.1%	2	.0%					31	.2%
Goulburn (Shep)	4	10.5%											4	.0%
Wangaratta	8	61.5%			1	.1%	1	.0%					10	.1%
MMC	25	6.8%	2	.1%	2	.0%	1	.0%					30	.1%
Western	19	7.4%	4	.3%	2	.0%							25	.2%
RCH	3	7.1%											3	.0%
Maroondah	14	17.1%	1	.2%	4	.1%	2	.0%					21	.2%
Northern	12	9.7%	1	.1%	2	.0%	1	.0%	1	.0%			17	.1%
Mercy (Werribee)	3	10.3%	1	.2%									4	.0%
RMH	15	5.0%	7	.4%	5	.1%	1	.0%					28	.1%
ST V's	13	7.3%	3	.4%	3	.1%							19	.2%
Williamstown							1	.0%					1	.0%
Angliss	2	7.4%	3	.5%	1	.0%							6	.0%
Ballarat	4	6.1%	1	.3%			1	.0%					6	.0%
Barwon Health	6	4.3%					1	.0%					7	.0%
Dandenong	14	4.8%	5	.3%	3	.0%	2	.0%	1	.1%			25	.2%
Wimmera Health	2	14.3%											2	.0%
Frankston	16	15.7%	8	1.0%	4	.1%	2	.0%					30	.2%
NLRH	5	6.9%	2	.3%									7	.1%
Mildura Base Hospital	8	23.5%	2	.3%									10	.1%

Table 2.25. ED presentations "DOA" by triage category and percentage of total presentations by hospital

Hospital	Category 1		Category 2		Category 3		Category 4		Category 5		Category 6		Total	
The Alfred	2	.5%	2	.1%	2	.0%	2	.0%	2	.1%	317	98.8%	327	2.1%
Bendigo											1	100.0%	1	.0%
Austin & Repat											1	100.0%	1	.0%
Box Hill							1	.0%			16	100.0%	17	.1%
Goulburn (Shep)									2	.1%	11	91.7%	13	.1%
Wangaratta											9	100.0%	9	.1%
MMC	4	1.1%									2	100.0%	6	.0%
Western											66	100.0%	66	.4%
RCH	1	2.4%									6	100.0%	7	.0%
Maroondah	1	1.2%									46	100.0%	47	.4%
Northern											1	100.0%	1	.0%
Mercy (Werribee)											60	100.0%	60	.6%
RMH											69	100.0%	69	.4%
Angliss											9	100.0%	9	.1%
Ballarat											26	100.0%	26	.2%
Barwon Health	1	.7%									22	100.0%	23	.1%
Dandenong											1	100.0%	1	.0%
Wimmera Health											6	100.0%	6	.1%
Echuca	2	18.2%									6	100.0%	8	.1%
Frankston											48	100.0%	48	.3%
Mildura Base Hospital	2	5.9%							6	.1%	6	100.0%	14	.1%

2.1.5 Triage category by hospital group

Triage category was analysed according to hospital group. The hospitals were aggregated according to hospital type. Group A1 hospitals represented 101,411 (28%) presentations, Group A2 hospitals represented 144,729 (40%) and Group B hospitals represented 116,483 (32%) presentations. Table 2.26, Table 2.27 and Table 2.28 display the hospitals representing the three groups and the number of emergency presentations.

Table 2.26. ED presentations by Group A1 hospitals

Hospital	Presentations	Percentage
The Alfred	15,373	15.2%
Austin & Repatriation Medical Centre	14,504	14.3%
Monash Medical Centre, Clayton	20,144	19.9%
Royal Children's Hospital	20,252	20.0%
Royal Melbourne Hospital	18,955	18.7%
St Vincent's Hospital	12,183	12.0%
Total	101,411	100.0%

Table 2.27. ED presentations by Group A2 hospitals

Hospital	Presentations	Percentage
Barwon Health	15,863	11.0%
Box Hill Hospital	14,093	9.7%
Dandenong Hospital	16,648	11.5%
Frankston Hospital	14,733	10.2%
Mercy Public Hospital	3,909	2.7%
Mercy Werribee	10,585	7.3%
Royal Victorian Eye & Ear Hospital	15,684	10.8%
Royal Women's Hospital	9,825	6.8%
Sunshine Hospital	10,019	6.9%
The Northern Hospital	17,514	12.1%
Western Hospital	15,856	11.0%
Total	144,729	100%

Table 2.28. ED presentations by Group B hospitals

Hospital	Presentations	Percentage
Angliss Health Services	12,390	10.6%
Ballarat Health Services	12,367	10.6%
Bendigo Health Care Group	13,907	11.9%
Echuca Regional Health	5,740	4.9%
Goulburn Valley Health (Shep)	10,293	8.8%
Maroondah Hospital	12,273	10.5%
Mildura Hospital	11,323	9.7%
New Latrobe Regional Hospital (Traralgon)	11,196	9.6%
South West Healthcare (Warrnambool)	8,578	7.4%
Wangaratta District Base Hospital	7,339	6.3%
Williamstown Hospital	6,235	5.4%
Wimmera Health Care Group	4,842	4.2%
Total	116,483	100%

2.1.6 Departure status of patients by triage category and hospital group

The majority of the patient population discharged from the EDs were discharged home (71%) or admitted to ward (20.7%). Of those discharged home, 35.1% were triaged to Category 4 and 19.4% were triaged to Category 5. Of those admitted to ward, 8.5% were triaged to Category 3, 7.7% to Category 4, 2.7% to Category 2, 1.3% to Category 5 and 0.6% to Category 1.

Of the other 8.3% of the population, 2.4% were transferred to another hospital, 0.8% left the emergency at own risk, 4.8% left the emergency before being seen, 0.1% died in ED and 0.2% were dead on arrival (DOA). Table 2.29 to Table 2.34 display these findings.

Table 2.29. Departure status from ED by hospital type for Triage Category 1

Departure Status	Group A1 Hospitals		Group A2 Hospitals		Group B Hospitals		Total	
Discharged home	190	12.7%	145	12.5%	30	7.1%	365	11.9%
Admitted to the ward	1,043	69.5%	735	63.4%	266	63.3%	2,044	66.4%
Transferred out of hospital	140	9.3%	163	14.1%	65	15.5%	368	11.9%
Left at own risk	18	1.2%	24	2.1%	5	1.2%	47	1.5%
Left before being seen	2	.1%	1	.1%	0		3	.1%
Died	101	6.7%	90	7.8%	49	11.7%	240	7.8%
Dead on Arrival (DOA)	7	.5%	1	.1%	5	1.2%	13	.4%
Total	1,501	100.0%	1,159	100.0%	420	100.0%	3,080	100.0%

Table 2.30. Departure status from ED by hospital type for Triage Category 2

Departure Status	Group A1 Hospitals		Group A2 Hospitals		Group B Hospitals		Total	
Discharged home	3,330	41.3%	2,720	38.0%	1,686	38.9%	7,736	39.6%
Admitted to the ward	3,846	47.7%	3,762	52.5%	2,312	53.4%	9,920	50.7%
Transferred out of hospital	758	9.4%	570	8.0%	277	6.4%	1,605	8.2%
Left at own risk	81	1.0%	74	1.0%	45	1.0%	200	1.0%
Left before being seen	24	.3%	16	.2%	3	.1%	43	.2%
Died	22	.3%	23	.3%	9	.2%	54	.3%
Dead on Arrival (DOA)	2	.0%	0		0		2	.0%
Total	8,063	100.0%	7,165	100.0%	4,332	100.0%	19,560	100.0%

Table 2.31. Departure status from ED by hospital type for Triage Category 3

Departure Status	Group A1 Hospitals		Group A2 Hospitals		Group B Hospitals		Total	
Discharged home	17,959	58.9%	21,336	59.2%	12,639	57.5%	51,934	58.7%
Admitted to the ward	10,248	33.6%	12,383	34.4%	8,271	37.6%	30,902	34.9%
Transferred out of hospital	1,511	5.0%	1,475	4.1%	732	3.3%	3,718	4.2%
Left at own risk	381	1.3%	416	1.2%	231	1.1%	1,028	1.2%
Left before being seen	357	1.2%	421	1.2%	104	.5%	882	1.0%
Died	17	.1%	16	.0%	7	.0%	40	.0%
Dead on Arrival (DOA)	2	.0%	0		0		2	.0%
Total	30,475	100.0%	36,047	100.0%	21,984	100.0%	88,506	100.0%

Table 2.32. Departure status from ED by hospital type for Triage Category 4

Departure Status	Group A1 Hospitals		Group A2 Hospitals		Group B Hospitals		Total	
Discharged home	35,509	72.7%	45,488	72.5%	46,191	80.0%	127,188	75.1%
Admitted to the ward	8,025	16.4%	11,523	18.4%	8,248	14.3%	27,796	16.4%
Transferred out of hospital	1,128	2.3%	832	1.3%	648	1.1%	2,608	1.5%
Left at own risk	520	1.1%	485	.8%	279	.5%	1,284	.8%
Left before being seen	3,640	7.4%	4,424	7.0%	2,374	4.1%	10,438	6.2%
Died	36	.1%	8	.0%	5	.0%	49	.0%
Dead on Arrival (DOA)	2	.0%	1	.0%	0		3	.0%
Total	48,860	100.0%	62,761	100.0%	57,745	100.0%	169,366	100.0%

Table 2.33. *Departure status from ED by hospital type for Triage Category 5*

Departure Status	Group A1 Hospitals		Group A2 Hospitals		Group B Hospitals		Total	
Discharged home	9,737	80.4%	31,956	85.5%	28,683	90.0%	70,376	86.5%
Admitted to the ward	518	4.3%	2,744	7.3%	1,310	4.1%	4,572	5.6%
Transferred to out of hospital	66	.5%	107	.3%	64	.2%	237	.3%
Left at own risk	102	.8%	60	.2%	89	.3%	251	.3%
Left before being seen	1,677	13.8%	2,514	6.7%	1,727	5.4%	5,918	7.3%
Died	11	.1%	2	.0%	0		13	.0%
Dead on Arrival (DOA)	2	.0%	0		8	.0%	10	.0%
Total	12,113	100.0%	37,383	100.0%	31,881	100.0%	81,377	100.0%

Table 2.34. *Departure status from ED by hospital type for Triage Category 6*

Departure Status	Group A1 Hospitals		Group A2 Hospitals		Group B Hospitals		Total	
Discharged home	1	.3%	0		1	.8%	2	.3%
Admitted to the ward	1	.3%	0		0		1	.1%
Left before being seen	2	.5%	0		0		2	.3%
Dead on Arrival (DOA)	395	99.0%	214	100.0%	120	99.2%	729	99.3%
Total	399	100.0%	214	100.0%	121	100.0%	734	100.0%

2.2 VEMD footprints

VEMD data were grouped by the emergency discharge diagnoses to create “Presentation Groups”. Presentation groups were created because it was felt these groups were more reflective of actual triage practice (eg. the triage nurse has no diagnosis at triage and has to work with the patient’s presenting complaint(s) to make a decision of triage category allocation).

2.2.1 Adult presentation footprints

2.2.1.1 Chest pain

The discharge diagnostic categories and corresponding ICD-10 codes identified and aggregated to represent the presentation group “Chest Pain” included:

Chest pain (NEC) [R074];	Pericarditis [I319];
Unstable angina [I200];	Injury to internal organ of thorax [S279];
AMI [I219];	Thoracic aneurysm with rupture [I711]; and
Angina, not unstable [I209];	Thoracic aneurysm without rupture [I712].
Pulmonary embolism [I269];	

In the three hospital groups (A1, A2 & B) patients presenting with chest pain were predominantly triaged to Categories 2 and 3. In Categories 1 and 2 patients were more frequently from Group A1 and A2 hospitals, respectively. In triage Categories 3 and 4 patients were most frequently from A2 hospitals. In Category 5 most patients [45%] were from Group B Hospitals. The significant association found between hospital site and triage categories ($\chi^2 = 477.44$, $df = 10$, $p < 0.0001$) suggests patients triaged to the higher acuity triage categories (Categories 1 & 2) were more frequently seen at the larger metropolitan hospitals (Groups A1 & A2) compared to the smaller regional hospitals. Patients triaged to the lower acuity category (Category 5) were more frequently seen at the regional hospitals (Group B).

Table 2.35. Triage categories “chest pain” presentations by hospital group

Triage Category	Group A1 Hospitals		Group A2 Hospitals		Group B Hospitals	
Category 1	91	1.8%	75	1.2%	36	0.8%
Category 2	2,397	48.6%	1,873	30.4%	1,545	36.3%
Category 3	1,855	37.6%	3,289	53.3%	2,123	49.8%
Category 4	545	11.1%	891	14.4%	496	11.6%
Category 5	33	0.7%	39	0.6%	59	1.4%
Category 6	7	0.1%	0	0	0	0
Total	4,928	100%	6,167	100%	4,259	100%

2.2.1.2 Shortness of breath

The discharge diagnostic categories and corresponding ICD-10 codes identified and aggregated to represent “Shortness of Breath” included:

Asthma [J459];	Emphysema [J439];
APO [J81];	Pneumonia [J181];
Bronchopneumonia [J180];	Pneumothorax, spontaneous or acute [J931]; and
CCF [I500];	Respiratory distress / dyspnoea / SOB [R060];
COAD [J449];	

The trend was for most patient presentations for “shortness of breath” to be triaged as Categories 3 or 4 within each hospital group (A1, A2 & B). The significant relationship found between hospital group and triage categories ($\chi^2 = 289.94$, $df = 10$, $p < 0.0001$) again suggests that patients triaged in the higher acuity categories (Categories 1 & 2) presented to the larger metropolitan hospitals compared to the smaller regional hospitals. Patients with shortness of breath triaged as Category 5 were most often from the smaller regional hospitals.

Table 2.36. Triage categories “shortness of breath” presentations by hospital group

Triage Category	Group A1 Hospitals		Group A2 Hospitals		Group B Hospitals	
	Count	Percentage	Count	Percentage	Count	Percentage
Category 1	208	5.0%	188	3.6%	48	1.3%
Category 2	755	18.2%	858	16.4%	422	11.5%
Category 3	1,953	47.0%	2,685	51.3%	1,816	49.3%
Category 4	1,171	28.2%	1,419	27.1%	1,229	33.4%
Category 5	62	1.5%	80	1.5%	165	4.5%
Category 6	5	0.1%	0	0	0	0
Total	4,154	100%	5,230	100%	3,680	100%

2.2.1.3 Abdominal pain

The discharge diagnostic categories and corresponding ICD-10 codes identified and aggregated to represent “Abdominal pain” included:

Appendicitis, acute [K359];	Abdominal/flank pain/cramps/intestinal colic [R104];
Biliary colic [K8050];	Abdominal aneurysm with rupture [I713];
Cholelithiasis [K8020];	Abdominal aneurysm without rupture [I714];
Constipation [K590];	Diarrhoea NOS/gastro/enteritis presumed infectious [A09];
Diverticulitis [K5790];	Epigastric/right upper quadrant pain [R101];
Gastritis [K297];	Peptic ulcer with haemorrhage and perforation [K272];
Indigestion [K30];	Peptic ulcer with perforation [K271];
Pancreatitis, acute [K85];	Peptic ulcer, with haemorrhage [K270];
Peritonitis [K659]; and	Diarrhoea, non infectious [K529];
Renal colic [N23].	Perforated / ruptured viscus [R198];

The trend was for most patient presentations to be triaged as Categories 3 or 4 within the Hospital groups (A1, A2 & B). The significant relationship found between hospital group and triage categories ($\chi^2 = 397.12$, $df = 10$, $p < 0.0001$) suggests in the higher acuity categories (1, 2 & 3) patients were most frequently from A2 and A1 hospitals, respectively. In triage Category 4 patients were most frequently from A2 and B group hospitals. As patients triaged in Category 5 were most often from the smaller regional B group hospitals.

Table 2.37. Triage categories for “abdominal pain” by hospital group

Triage Category	Group A1 Hospitals		Group A2 Hospitals		Group B Hospitals	
Category 1	18	0.2%	24	0.2%	7	0.1%
Category 2	319	3.4%	358	2.7%	145	1.5%
Category 3	3,209	33.7%	4,353	33.4%	2,329	24.6%
Category 4	5,150	54.2%	7,438	57.0%	6,082	64.3%
Category 5	808	8.5%	872	6.7%	890	9.4%
Category 6	5	0.1%	0	0	0	0
Total	9,509	100%	13,045	100%	9,453	100%

2.2.2 Paediatric presentation footprints

2.2.2.1 Shortness of breath

The discharge diagnostic categories and corresponding ICD-10 codes identified and aggregated to represent “Shortness of breath” included:

Croup [J050];	Pneumonia [J181];
Asthma [J459];	Pneumothorax, spontaneous or acute [J931];
Bronchiolitis [J219];	Respiratory distress [R060]; and
Childhood asthma [J450];	URTI [J069];
Epiglottitis, acute [J051];	

The trend was for most patient presentations to be triaged as Categories 3 or 4 within the Hospital groups (A1, A2 & B). Patients within Group B were most frequently triaged to Categories 4 and 3. The significant association found between hospital group and triage categories ($\chi^2 = 355.63$, $df = 10$, $p < 0.0001$) suggests in the higher acuity categories (1, 2 & 3) patients were most frequently from A2 and A1 hospitals, respectively. In triage Category 4 patients were most frequently from A2 followed by A1 and B hospitals. As patients triaged within category 5 were most often from A1, B and A2 hospitals.

Table 2.38. Triage categories “shortness of breath” paediatric presentations by hospital group

Triage Category	Group A1 Hospitals		Group A2 Hospitals		Group B Hospitals	
Category 1	15	0.4%	14	0.4%	2	0.1%
Category 2	318	9.0%	281	7.7%	56	2.3%
Category 3	1,331	37.5%	1,656	45.4%	739	30.4%
Category 4	1,435	40.5%	1,417	38.9%	1,223	50.3%
Category 5	445	12.6%	278	7.6%	412	16.9%
Category 6	1	0.0%				
Total	3,545	100%	3,646	100%	2,432	100%

2.2.2.2 Arm fractures

The discharge diagnostic categories and corresponding ICD-10 codes identified and aggregated to represent “Arm fractures” included:

- Fracture of forearm [S529];
- Fracture of wrist [S628];
- Sprain / strain of wrist [S6350]; and
- Other specified nature of injury to forearm [S598]

The highest incidence of patients presenting with arm fractures was to A2 hospitals with 2,970 (38.8%) presentations. The trend was for most patient presentations to be triaged to Categories 4 & 3 within the three hospital groups (A1, A2 & B). Patients within Group B were most frequently triaged to Category 4 (60.2%). The significant association found between hospital group and triage categories ($\chi^2 = 357.36$, $df = 8$, $p < 0.0001$) suggests in the higher acuity categories (1, 2 & 3) patients were most frequently from A2 and A1 hospitals, respectively. In triage Category 4 patients were most frequently from B followed by A1 and A2 hospitals. As patients triaged within Category 5 were most often (53%) from B group hospitals.

Table 2.39. Triage categories for arm fracture presentations by hospital group

Triage Category	Group A1 Hospitals		Group A2 Hospitals		Group B Hospitals	
Category 1	5	0.3%	6	0.2%	1	0.0%
Category 2	58	3.0%	101	3.4%	30	1.1%
Category 3	505	26.2%	933	31.4%	425	15.4%
Category 4	1,106	57.4%	1,611	54.3%	1,663	60.3%
Category 5	252	13.1%	316	10.7%	641	23.2%
Total	1,926	100%	2,967	100%	2,760	100%

3 Case Scenarios

Most of the early studies that have attempted to compare triage nurse decisions have involved the use of written paper based patient scenarios^{1,2}. Traditional paper based scenarios have been widely used and tested. However, it has been recognised these do not provide either visual or aural stimuli. Current technology provides the opportunity to enhance scenarios with stimuli that may improve accuracy of the decision making process. However, the use of computer technology to deliver triage is until now, untested. For this component of the project, triage scenarios were developed using the traditional paper based format and a computer based format.

3.1 Development of case scenarios

The project team developed fourteen adult and fourteen paediatric case scenarios, with each reflecting a specific triage category. The examination of the VEMD informed the development of the case scenarios. The VEMD demonstrated that Triage Categories 3 and 4 were by far the most common categories and consequently, more scenarios were developed to represent these categories. A combination of paper based and computer based formats was used to present the scenarios to participants. There were seven adult and seven paediatric computer scenarios and seven adult and seven paediatric paper based scenarios. The distribution of scenarios by format, patient group and triage category is shown in Table 3.1.

Table 3.1. *Distribution of case scenarios by triage category*

Triage Category	Adult scenarios		Paediatric scenarios	
	Paper based	Computer based	Paper based	Computer based
1	1	1	1	1
2	1	1	1	1
3	2	2	2	2
4	2	2	2	2
5	1	1	1	1

All of the scenarios were written in a consistent manner. This ensured that the information for each scenario was presented in the same format and order. The computer scenarios were presented on a laptop computer and each scenario commenced with a brief presenting complaint and still image(s) of the patient. Participants were then given the remainder of the scenario information. Participants were required to make a clinical decision and allocate a triage category to each scenario on the basis of the information provided.

All scenarios (both written and computer) contained the following information:

Patient age;	Heart rate;
Patient gender;	Skin status;
Mode of arrival;	Neurological status;
Presenting problem;	Pain status;
Respiratory rate;	Temperature;
Use of accessory muscles;	Past medical history and medications; and
SaO ₂ ;	

The scenarios (and the expected triage category) were presented to the steering committee as a panel of experts in emergency care. Comments were invited using e-mail to the project team. Minor alterations were made to some scenarios until there was complete agreement that the scenarios were clearly understandable and accurately reflected the triage category for which they were designed.

3.2 Recruitment of participants

The recruitment process of eligible triage nurses was described in *Section 1.3.2*. All eligible ED Triage Nurses who agreed to participate in the scenario completion component of project were grouped by hospital site and included in the sampling pool.

Scenario completion occurred at 26 sites. Dandenong Hospital was excluded from scenario completion, as this was the site at which piloting of the data collection systems occurred. The Royal Victorian Eye and Ear Hospital declined to participate in the scenario completion given the highly specialised nature of their ED, but expressed a keen interest in being involved in the development of education and quality improvement strategies.

3.2.1 Sampling

Stratified random sampling was used to select the required number of ED Triage Nurses from each hospital site. The number of ED Triage Nurses recruited from each site was dependent on the number of triage nurses employed at the hospital. The project aimed to recruit five ED Triage Nurses from EDs with less than or equal to twenty triage nurses and ten ED Triage Nurses from EDs with greater than twenty triage nurses.

Using this formula, the estimated sample size of ED Triage Nurses who would participate in completing the case scenarios was one hundred and eighty-five. Unfortunately, due to issues related to recruiting participants, the resulting sample size was one hundred and seventy eight. Difficulties encountered included a smaller response rate than desired, staff resignations and leave.

Not all participating hospitals manage both adults and paediatrics, therefore, ED Triage Nurses employed in EDs that provided care to only adult patients (RMH, St Vincent's and the Alfred) were asked to complete a total of fourteen adult scenarios - seven in written format and seven in computer format. ED Triage Nurses employed in EDs that provide care to only paediatric patients (RCH) were asked to complete a total of fourteen paediatric scenarios - seven in a paper based format and seven in an computer format. ED Triage. Whilst nurses employed in EDs that provide care to both adult and paediatric patients were requested to complete all of the twenty-eight scenarios.

The sampling methods outlined aimed to provide:

2,450 adult scenarios (1,225 paper based and 1,225 computer) completed by 175 nurses.

2,100 paediatric scenarios (1,050 paper based and 1,050 computer) completed by 150 nurses.

In arriving at these sample sizes, system considerations and practical concerns guided the statistical estimation of an adequate number of subjects needed to detect a clinically significant difference. It was estimated that a minimum of 800 scenarios per patient population (i.e. adult and paediatric) was required to estimate agreement beyond chance (κ) to within five percent of its true value after adjustment for possible confounders and after considering participant dropouts and refusals.

Table 3.2 displays the participant hospitals, recruitment process and the number of triage nurse participants from each hospital.

Table 3.2. Recruitment of triage nurses for case scenarios

Hospital	Letters distributed	Replies	Consent	Desired Sample Size	Participants	Type of Scenarios
Angliss Health Service	11	10	7	5	5	Both
ARMC	32	10	10	10	10	Both
Ballarat Health Services	23	5	5	5	5	Both
Barwon Health - Geelong	27	16	16	5	5	Both
Bendigo Base Hospital	15	11	11	5	5	Both
Box Hill Hospital	12	12	10	10	10	Both
Echuca Hospital	6	5	5	5	5	Both
Frankston Hospital	20	16	16	5	5	Both
GV Health Care -	24	11	10	10	10	Both
Latrobe Regional Hospital	16	11	11	5	5	Both
Maroondah Hospital	18	13	12	5	5	Both
Mercy Hospital for Women	10	6	6	5	5	Both
Mildura Base Hospital	10	6	6	5	5	Both
Monash Medical Centre	45	31	30	10	10	Both
Royal Childrens' Hospital	25	14	14	10	10	Paed
Royal Melbourne Hospital	30	8	8	10	8	Adult
Royal Womens' Hospital	12	9	10	5	5	Both
SW Hlth Care -	10	6	6	5	5	Both
St Vincent's Hospital	30	12	9	10	9	Adult
Sunshine Hospital	23	9	9	10	9	Both
The Alfred Hospital	31	11	8	10	8	Adult
The Northern Hospital	30	12	9	10	9	Both
The Williamstown Hospital	10	6	5	5	5	Both
Wangaratta Hospital	10	6	5	5	5	Both
Werribee Mercy Hospital	10	5	5	5	5	Both
Western Hospital	13	13	10	5	5	Both
Wimmera Hlth (Horsham)	10	5	5	5	5	Both
Total	513	279	258	185	178	

Two members of the project team carried out the random sampling process. For each participating site, each triage nurse who had agreed to participate was allocated a number. One project team member then placed numbered pieces of paper corresponding with eligible participants into a box. The other member of the project team, who was blinded to this process, then drew the numbers from the box, these numbers (representing the triage nurses) formed the list of participants. The project team negotiated with the ED NUM to determine which day(s) and time(s) would be suitable for the Project Triage Nurses to visit the ED. In some instances a confirmatory phone call was made to the ED the day before the visit to confirm availability of participants.

3.3 Data collection method

Each participant was asked to complete a demographic profile prior to completion of the suite of case scenarios. This was paper based and later entered into a computer software package for analysis. The demographic profile included information such as age, gender, years of emergency nursing experience, years of triage experience, current position and educational preparation / qualifications. The ED triage nurses received instructions from the Project Triage Nurse on how to complete the data collection sheets for the paper based and computer based scenarios. The data collected from the case scenarios represented the allocation of one of the five NTS categories for each triage scenario.

3.4 Results

3.4.1 Demographics of the participants

A total of 178 subjects participated in the case scenario arm of this study. Participants had an average age of 36 years and were predominantly female. Similar proportions were enrolled from each of the three hospital groups. Ninety-two percent were registered nurses (RN), clinical Nurse specialists (CNS), or associate charge nurses (ACN). Eight percent were identified as NUMs (5%) or "other" working in the department.

The participants had wide experience in the profession. About eighty percent identified having a post-graduate qualification, with about twenty-eight percent completing a graduate certificate in emergency nursing and thirteen percent having a graduate diploma in the same field. The average emergency department and triage experience of the group was about eight and six years, respectively. The demographic characteristics of the participants are displayed in Table 3.3 values are presented as mean (standard deviation) for continuous variables and as frequencies (percentages) for categorical variables.

Table 3.3. Demographic characteristics of case scenario participants

Characteristics		Representation	
Number of subjects		178	
Average age		36.09 years	±7.93 SD
Number of females		159	89.33%
Hospital group:	A1	55	30.90%
	A2	58	32.58%
	B	65	36.52%
Current position:	RN	82	46.86%
	CNS	35	20.00%
	ACN	44	25.14%
	NUM	8	4.57%
	Other	6	3.43%
Average experience:	Emergency department	8.7 years	±5.75 SD
	Triage	6.8 years	±5.1 SD
	Time in current position	4.3 years	±4.6 SD
General qualifications:	Hospital certificates	100	56.50%
	Undergraduate degrees	96	54.24%
	Postgraduate degrees	142	80.23%
Postgraduate qualifications	Graduate certificates		
	Emergency	49	27.68%
	ICU	12	6.78%
	CCU	6	3.39%
	Critical care	23	12.99%
	Midwifery	26	14.69%
	Paediatrics	2	1.13%
	Occupational Health	1	0.56%
	Mental Health	1	0.56%
	Other	4	2.26%
	Graduate diplomas		
	Emergency	23	12.99%
	Midwifery	2	1.13%
	Critical care	20	11.30%
	ICU	3	1.69%
Paediatrics	3	1.69%	
Mental Health	1	0.56%	
Other	8	4.52%	

3.4.2 Comparisons of the study population

The characteristics of participants were compared by gender and although females outnumbered males by a ratio of about 8:1, there were no statistically significant differences in terms of age, current position, or general qualifications. Females were noted to have spent a longer time in their current positions and in the emergency department.

However, as displayed in Table 3.4, when characteristics of participants were compared according to hospital group there were a number of statistically significant differences. The average age of nurses increased steadily from Group A1 through to Group B hospitals. That is the participants from Group B hospitals were generally older than Group A1 hospitals. The distributions of nursing positions were likewise statistically significantly different; the proportions of RNs decreased and ACNs increased as one went from A1, A2, and B hospitals. That is, there was a higher proportion of participants who were ACNs from Group B than Group A1 Hospitals. Given these findings, it is no surprise that self-reported experience differs across the range of hospital designations. Participants from Group A2 hospitals generally showed greater experience, at least in terms of the length of time spent in the emergency department, triage, or current positions. In contrast, nurses from Group A1 hospitals showed shorter lengths of times.

Table 3.4. Hospital group-specific comparisons of the participants

Characteristics		Hospital A1		Hospital A2		Hospital B		p-value
Number of subjects		55		58		65		
Number of females		48	87.3%	56	96.6%	55	84.6%	0.069
Average age		33.12	±7.08	36.4	±7.78	38.59	±8.04	0.002
Current position:	RN	34	62.96%	26	45.61%	22	34.38%	0.032
	CNS	7	12.96%	14	24.56%	14	21.88%	
	ACN	10	18.52%	11	19.30%	23	35.94%	
	NUM	0		4	7.02%	4	6.25%	
	Other	3	5.56%	2	3.51%	1	1.56%	
Average experience: (months)	ED	77.16	±51.83	121.1	±70.87	111.58	±74.1	0.002
	Triage	56.82	±47.08	97.33	±59.42	88.06	±67.38	0.001
	Time in current position	40.62	±37.04	64.53	±53.88	49.86	±54.52	0.037

3.4.3 Adult computer based scenarios

3.4.3.1 Scenario 1 (Triage Category 2)

Fifty-three year old male presents by ambulance with sudden onset of crushing central chest pain 3 hours ago. He got pain whilst he was chopping down a tree in his garden. On arrival he is in a semi-recumbent position on the ambulance trolley.

His respiratory rate is 18 with no use of accessory muscles and his oxygen saturation is 99%

His heart rate is 68 (regular), and his skin is pale, cool and moist

His blood pressure is 135/75

His GCS is 15

He is complaining of crushing central chest pain 9/10 with no radiation

His temperature is 36.6

He has no relevant past medical history.

Table 3.5 displays the frequency of agreement between the Adult Computer Based Scenario 1 and the triage nurse, for each hospital (de-identified). Triage nurses from ten hospitals had 100% agreement with the scenario.

Of the four cases under triaged and the 23 cases over triaged, all cases were within one category of the expected triage category.

Table 3.5. Triage agreement for Adult Computer Based Case Scenario 1

Hospital	Agreement		Under triaged		Over triaged	
1	5	100%				
2	8	100%				
3	9	90%			1	10%
4	9	100%				
5	9	90%	1	10.0%		
6	3	75%			1	25%
7	7	70%	1	10.0%	2	20%
8	4	100%	1	20.0%		
9	5	100%				
10	4	80%			1	20%
11	4	66.7%			2	33.3%
12	7	77.8%	1	11.1%	1	11.1%
13	3	60%			2	40%
14	6	75%			2	25%
15	8	88.9%			1	11.1%
16	9	100%				
17	4	80%			1	20%
18	5	100%				
19	5	100%				
20	5	100%				
21	2	40%			3	60%
22	3	60%			2	40%
23	5	100%				
24	5	100%				
25	4	80%			1	20%
26	2	40%			3	60%
Total	140	83.8%	4	2.4%	23	23.8%

3.4.3.2 Scenario 2 (Triage Category 5)

Forty-eight year old male presents alone complaining of a red and watery right eye. He is able to walk to the triage desk unassisted. He states that he was stripping wallpaper yesterday and spent most of the day working in plaster dust.

His respiratory rate is 16 with no use of accessory muscles and his oxygen saturation is 98%

His heart rate is 72 and his skin is pale, warm and dry

His blood pressure is 130/70

His eye is red and slightly watery, he has normal vision

His GCS is 15

He is not complaining of any pain

He has no relevant past medical history.

Table 3.6 indicates by hospital the frequency of agreement between the Adult Computer Based Scenario 2 and the triage nurse. The majority of triage nurses over triaged with this scenario.

Of the 125 cases over triaged, 88 (70.4%) were within one category (Category 4) of the expected triage category. Thirty-five (28%) were within two categories (Category 3) of the expected triage category, one (0.8%) was within three categories (Category 2) and one (0.8%) was within four categories (Category 1) of the expected triage Category 5.

Table 3.6. Triage agreement for Adult Computer Based Case Scenario 2

Hospital	Agreement		Under triaged	Over triaged	
1	1	20%		4	80%
2	1	12.5%		7	87.5%
3	1	10%		9	90%
4	1	11.1%		8	88.9%
5				10	100%
6	4	100%			
7	4	40%		6	60%
8	2	40%		3	60%
9				5	100%
10				5	100%
11	5	83.3%		4	16.7%
12	3	33.3%		6	66.6%
13	1	20%		4	80%
14				8	100%
15	6	66.7%		3	33.3%
16	2	22.2%		7	77.8%
17				5	100%
18				5	100%
19				5	100%
20				5	100%
21	2	40%		3	60%
22	4	80%		1	20%
23	1	20%		4	80%
24	1	20%		4	80%
25	1	20%		4	80%
26	1	20%		4	80%
Total	42	25.1%		125	74.9%

3.4.3.3 Scenario 3 (Triage Category 3)

Forty-five year old female presents with a friend complaining of a frontal headache. She is unable to walk to the triage desk and arrives in a wheelchair being pushed by her friend. She tells you that the headache has been of gradual onset for the last twelve hours and complains of associated vomiting and visual disturbance. She states that her headache is typical of her usual migraines. She had two Panadiene Forte three hours ago.

Her respiratory rate is 24 with no use of accessory muscles and her oxygen saturation is 97%

Her heart rate is 102 (regular), and her skin is pale, cool and dry

Her blood pressure is 125/80

Her GCS is 15

She is complaining of a frontal headache 5/10 with no radiation

Her temperature is 36.8

She has a history of migraine and depression for which she takes antidepressants.

Table 3.7. indicates by hospital the frequency of agreement between the Adult Computer Based Scenario 3 and the triage nurse. Approximately Seventy-two percent were in agreement with this scenario. Of the 43 cases where under triaging took place, 40 (93%) were within one category (Category 4) of the expected triage category and three (7%) were within two categories (Category 5). Of the four cases over triaged, three (75%) were within one category (Category 2) of the expected triage category and one (25%) was within two categories (Category 1).

Table 3.7. Triage agreement for Adult Computer Based Case Scenario 3

Hospital	Agreement		Under triaged		Over triaged	
1	4	80%	1	20%		
2	6	85.7%	1	14.4%		
3	7	70%	3	30%		
4	7	77.8%	2	22.2%		
5	6	60%	3	30%	1	10%
6	1	25%	3	75%		*
7	5	50%	5	50%		
8	3	60%	2	40%		
9	5	100%				
10	5	100%				
11	5	83.3%	1	16.7%		
12	6	66.7%	3	33.3%		
13	4	80%			1	20%
14	7	87.5%	1	12.5%		
15	4	44.4%	4	44.4%	1	11.1%
16	8	88.9%	1	11.1%		
17	4	80%	1	20%		
18	4	80%	1	20%		
19	4	80%	1	20%		
20	4	80%	1	20%		
21	3	60%	1	20%	1	20%
22	3	60%	2	40%		
23	5	100%				
24	3	60%	2	40%		
25	3	60%	2	40%		
26	4	80%	1	20%		
Total	120	71.9%	43	25.7%	4	2.4%

3.4.3.4 Scenario 4 (Triage Category 1)

Twenty-one year old female presents by ambulance following a motor car accident. She was the driver of a car that struck the rear of a parked truck at 80 kph. On arrival she is in a supine position the ambulance trolley. She has a haematoma to the left side of her forehead and an obvious seatbelt mark across her chest and abdomen. She has a cervical collar insitu and oxygen at 10 L/minute via a Hudson mask.

Her respiratory rate is 32 with no use of accessory muscles, and her oxygen saturation is 94%

Her heart rate is 142 (regular) and her skin is pale, cold and moist

Her blood pressure is 100/60

Her GCS is 7 (eye opening to pain, no verbal response, withdrawal to pain)

Her temperature is 36.2

She has no relevant medical past history.

Table 3.8 indicates by hospital the frequency of agreement between the Adult Computer Based Scenario 4 and the triage nurse. Nearly fifty-nine percent of nurses were in agreement with the expected triage scenario. Of the 69 cases where under triaging took place, 64 (92.8%) cases were under triaged by the triage nurse within one category of the expected triage category, four (5.8%) cases were within two categories and one case (1.4%) was within three categories.

Table 3.8. Triage agreement for Adult Computer Based Case Scenario 4

Hospital	Agreement		Under triaged		Over triaged
1	3	60%	2	40%	
2	6	75%	2	25%	
3	7	70%	3	30%	
4	4	44.4%	5	55.6%	
5	2	20%	8	80%	
6	1	25%	3	75%	
7	7	70%	3	30%	
8	1	20%	4	80%	
9	3	60%	2	40%	
10	4	80%	1	20%	
11	5	83.3%	1	16.7%	
12	8	88.9%	1	11.1%	
13	3	60%	2	40%	
14	6	75%	2	25%	
15	3	33.3%	6	66.7%	
16	8	88.9%	1	11.1%	
17	2	40%	3	60%	
18	2	40%	3	60%	
19	4	80%	1	20%	
20	3	60%	2	40%	
21	4	80%	0	20%	
22	1	20%	4	80%	
23	3	60%	2	40%	
24	3	60%	2	40%	
25	3	60%	2	40%	
26	2	40%	3	60%	
Total	98	58.7%	69	41.3%	

3.4.3.5 Scenario 5 (Triage Category 4)

Seventy- year old female presents with her daughter who reports a three-day history of increasing confusion and urinary incontinence. The patient is able to walk to the triage desk unassisted.

Her respiratory rate is 18 with no use of accessory muscles, she is able to speak in full sentences and her oxygen saturation on room air is 98%

Her heart rate is 84 (regular) and her skin is pink, warm and dry

Her blood pressure is 115/80

Her GCS is 14 (confused to time and place)

She is not complaining of any pain

Her temperature is 37.9

She has a past history of rheumatoid arthritis for which she takes Voltaren.

Table 3.9 indicates by hospital the frequency of agreement between the Adult Computer Based Scenario 5 and the triage nurse. Seventy-one percent of triage nurses were in agreement with the expected triage category of the scenario.

Of the 17 cases where under triaging took place, and the 32 cases over triaged, all were within one category of the expected triage category.

Table 3.9. Triage agreement for Adult Computer Based Case Scenario 5

Hospital	Agreement		Under triaged		Over triaged	
1	4	80%			1	20%
2	6	75%	1	12.5%	1	12.5%
3	8	80%			2	20%
4	9	100%				
5	7	70%			3	30%
6	1	25%	3	75%		
7	6	60%	3	30%	1	10%
8	1	20%	2	40%	2	40%
9	4	80%			1	20%
10	4	80%			1	20%
11	4	66.7%	2	33.3%		
12	6	66.7%			3	33.3%
13	4	80%			1	20%
14	6	75%			2	25%
15	4	44.4%	3	33.3%	2	22.2%
16	5	55.6%			4	44.4%
17	4	80%	1	20%		
18	4	80%			1	20%
19	5	100%				
20	5	100%				
21	2	40%			3	60%
22	3	60%	2	40%		
23	3	60%			2	40%
24	5	100%				
25	5	100%				
26	3	60%			2	40%
Total	118	70.7%	17	10.2%	32	19.2%

3.4.3.6 Scenario 6 (Triage Category 3)

Twenty-six year old male presents with his wife complaining of sudden onset of abdominal pain. He is able to walk slowly to the triage desk but requires assistance from his wife. He has had pain for 12 hours but it has become much worse in the last 2 hours. He has vomited once and had two episodes of diarrhoea. He has not eaten today.

His respiratory rate is 24 with no use of accessory muscles and his oxygen saturation is 99%

His heart rate is 98 (regular), and his skin is pale, cool and dry

His blood pressure is 100/75

His GCS is 15

He is complaining of right sided abdominal pain 6/10 with no radiation

His temperature is 37.8

He has no relevant past medical history.

Table 3.10 indicates by hospital the frequency of agreement between the Adult Computer Based Scenario 6 and the triage nurse. Nearly 78% of nurses agreed with the scenario.

Of the 33 cases where under triaging took place, 32 (97%) cases were under triaged within one category of the expected triage category and one case was triaged within two categories. Of the 6 cases over triaged, all were within 1 category of the expected triage category.

Table 3.10. Triage agreement for Adult Computer Based Case Scenario 6

Hospital	Agreement		Under triaged		Over triaged	
1	4	80%	1	20%		
2	7	87.5%			1	12.5%
3	9	90%	1	10%		
4	7	77.8%	2	22.2%		
5	8	80%	2	20%		
6	2	50%	1	25%	1	25%
7	7	70%	2	20%	1	10%
8	2	40%	2	40%	1	20%
9	5	100%				
10	3	60%	1	20%	1	20%
11	3	50%	3	50%		
12	5	55.6%	4	44.4%		
13	5	100%				
14	7	87.5%	1	12.5%		
15	5	55.6%	4	44.4%		
16	8	88.9%	1	11.1%		
17	5	100%				
18	4	80%	1	20%		
19	3	60%	2	40%		
20	4	80%	1	20%		
21	4	80%			1	20%
22	4	80%	1	20%		
23	4	80%	1	20%		
24	5	100%				
25	5	100%				
26	3	60%	2	40%		
Total	128	76.6%	33	19.8%	6	3.6%

3.4.3.7 Scenario 7 (Triage Category 3)

Fifty-seven year old female presents with a friend following an injury to her right wrist. She is able to walk to the triage desk unassisted and has a sling on her right arm. She states she injured her wrist when she tripped on uneven ground in her front yard. Her friend witnessed the fall and she had no loss of consciousness.

Her respiratory rate is 20 with no use of accessory muscles and her oxygen saturation is 98%

Her heart rate is 78 and her skin is pale, warm and dry

Her blood pressure is 145/85

Her GCS is 15

She is complaining of a painful right wrist 3/10

Her right wrist is deformed and the neurovascular status of the right hand is normal

She has a past history of a left CVA two years ago resulting in a mild right hemiparesis and right facial droop.

Her only medication Aspirin.

Table 3.11 indicates by hospital the frequency of agreement between the Adult Computer Based Scenario 7 and the triage nurse. Nearly 67% of nurses agreed with the expected category of the scenario.

Of the 14 cases where under triaging took place, all were within one category of the expected triage category. Of the 42 cases over triaged, 97.6% were within one category of the expected triage category and one case was within two categories.

Table 3.11. Triage agreement for Adult Computer Based Case Scenario 7

Hospital	Agreement		Under triaged		Over triaged	
1	3	60%			2	40%
2	7	87.5%	1	12.5%		
3	10	100%				
4	6	66.7%			3	33.3%
5	10	100%				
6			4	100%		
7	9	90%	1	10%		
8	3	60%			2	40%
9	4	80%			1	20%
10	4	80%			1	20%
11	1	16.7%	3	50%	2	33.3%
12	6	66.7%			3	33.3%
13	1	20%			4	80%
14	5	62.5%			3	37.5%
15	5	55.6%	2	22.2%	2	22.2%
16	6	66.7%			3	33.3%
17	3	60%			2	40%
18	5	100%				
19	4	80%			1	20%
20	2	40%			3	60%
21	2	40%			3	60%
22	1	20%	2	40%	2	40%
23	2	40%			3	60%
24	3	60%	1	20%	1	20%
25	4	80%			1	20%
26	5	100%				
Total	111	66.5%	14	8.4%	42	25.1%

3.4.4 Paediatric computer based scenarios

3.4.4.1 Scenario 1 (Triage Category 3)

Three-year-old male presents with his parents with a three-day history of vomiting and diarrhoea. His mother carries him to the triage desk. The mother states he still has diarrhoea but is tolerating small amounts of oral fluid. She states that he has not vomited today. She is unable to tell you about the number of wet nappies as he has had 8 episodes of watery diarrhoea today.

His respiratory rate is 28 with no use of accessory muscles, he cries when you approach him and his oxygen saturation is 99%
 His heart rate is 124 (regular), and his skin is pale, cool and dry
 His tongue and mucous membranes are dry
 He is crying intermittently but is consolable by his mother and is asking for a drink
 He opens his eyes to speech
 His mother states that he is complaining of abdominal pain
 His temperature is 37.8
 He has no past medical history

Table 3.12 displays the frequency of agreement between the Paediatric Computer Based Scenario 1 and the triage nurse, for each hospital. Sixty-seven percent of nurses agreed with the expected triage category of the scenario.

Of the 45 cases where under triaging and the eight cases over triaged, all were within one category of the expected triage category.

Table 3.12. Triage agreement for Paediatric Computer Based Scenario 1

Hospital	Agreement		Under triaged		Over triaged	
1	3	60%	1	20%	1	20%
3	9	90%	1	10%		
4	6	66.7%	2	22.2%	1	11.1%
5	9	90%			1	10%
6	1	25%	2	50%	1	25%
7	6	60%	4	40%		
8	4	80%	1	20%		
9	4	80%	1	20%		
10	3	60%	1	20%	1	20%
11	3	50%	2	33.3%	1	16.7%
12	4	44.4%	5	55.6%		
13	4	80%	1	20%		
15	2	22.2%	6	66.7%	1	11.1%
16	8	88.9%	1	11.1%		
17	3	60%	2	40%		
18	3	60%	2	40%		
19	3	60%	2	40%		
20	4	80%	1	20%		
21	4	80%			1	20%
22	3	60%	2	40%		
23	5	100%				
24	3	60%	2	40%		
25	4	80%	1	20%		
26	4	80%	1	20%		
27	6	60%	4	40%		
Total	108	67.1%	45	28%	8	5%

3.4.4.2 Scenario 2 (Triage Category 4)

Six-month-old male presents with his parents with a one-day history of febrile illness and cough. His mother carries him to the triage desk. He has a moist sounding cough and a runny nose.

His respiratory rate is 24 with no use of accessory muscles, he is making “baby talk” noises and his oxygen saturation is 98%

His heart rate is 112 and his skin is pink, warm and dry

He is alert but cries when you approach him

His tongue and mucous membranes are moist

His temperature is 38.4

He has no past medical history.

Table 3.13 indicates by hospital the frequency of agreement between the Paediatric Computer Based Scenario 2 and the triage nurse. Sixty-eight percent of triage nurses were in agreement with the scenario.

Of the 17 cases where under triaging took place and the 35 cases that were over triaged, all were within one category of the expected triage category.

Table 3.13. Triage agreement for Paediatric Computer Based Scenario 2

Hospital	Agreement		Under triaged		Over triaged	
1	5	100%				
3	7	70%			3	30%)
4	9	100%				
5	8	80%	1	10%	1	10%
6	2	50%	2	50%	1	25%
7	9	90%			1	10%
8	2	40%	1	20%	2	40%
9	2	40%			3	60%
10	2	40%			3	60%
11	2	33.3%	1	16.7%	3	50%
12	7	77.8%	2	22.2%		
13	4	80%			1	20%
15	4	44.4%	5	55.6%		
16	4	44.4%			5	55.6%
17	2	40%	1	20%	2	40%
18	3	60%			2	40%
19	5	100%				
20	5	100%				
21	3	60%			2	40%
22	4	80%	1	20%		
23					5	100%
24	3	60%	1	20%	1	20%
25	5	100%				
26	4	80%			1	20%
27	8	80%	2	20%		
Total	109	67.7%	17	10.6%	35	21.7%

3.4.4.3 Scenario 3 (NTS category 4)

Thirteen-month-old female presents with her parents with a one-day history of diarrhoea. Her mother carries her to the triage desk. Her mother states that she thinks that the number of wet nappies is close to normal but is not sure as the child has had seven episodes of diarrhoea today. Her mother states that over the last day she has had approximately three-quarters of her usual amount of fluid and has been unsettled.

Her respiratory rate is 22 with no use of accessory muscles and her oxygen saturation is 99%

Her heart rate is 92 and her skin is pink, warm and dry

She is alert and cries when you approach her

Her tongue and mucous membranes are moist

Her temperature is 38.2

She has no relevant past history.

Table 3.14 indicates by hospital the frequency of agreement between the Paediatric Computer Based Scenario 3 and the triage nurse. Seventy-two percent of triage nurses were in agreement with the scenario.

Of the 22 cases where under triaging took place, all were within one category of the expected triage category. Of the 23 cases over triaged, 22 (95.6%) were within one category of the expected triage category and one (4.4%) was within two categories.

Table 3.14. Triage agreement for Paediatric Computer Based Scenario 3

Hospital	Agreement		Under triaged		Over triaged	
1	3	60%	1	20%	1	20%
3	8	80%			2	20%
4	8	88.9%			1	11.1%
5	10	100%				
6	2	50%	2	50%		
7	7	70%	2	20%	1	10%
8	4	80%			1	20%
9	5	100%				
10	4	80%			1	20%
11	3	50%	1	16.7%	2	33.3%
12	6	66.7%	3	33.3%		
13	3	60%			2	40%
15	3	33.3%	6	66.7%		
16	6	66.7%			3	33.3%
17	4	80%	1	20%		
18	5	100%				
19	5	100%				
20	5	100%				
21	3	60%			2	40%
22	5	100%				
23	1	20%			4	80%
24	3	60%	1	20%	1	20%
25	3	60%			2	40%
26	5	100%			3	60%
27	5	50%	5	50%		
Total	116	72%	22	13.7%	23	14.3%

3.4.4.4 Scenario 4 (Triage Category 5)

Three-year-old male presents with his aunt with a painful left ear. He is able to walk to the triage desk unassisted. His aunt states that the patient is staying with her whilst his parents are away for the weekend and that he was unable to sleep last night because of an earache in his left ear. His aunt requests that someone “check him out”.

His respiratory rate is 16 with no use of accessory muscles and his oxygen saturation is 98%

His heart rate is 88 and his skin is pink, warm and dry

He is alert

She states his ear is not painful now and he has not taken anything for the earache

His temperature is 37.6

He has no relevant past medical history.

Table 3.15 indicates by hospital the frequency of agreement between the Paediatric Computer Based Scenario 4 and the triage nurse. Nearly 56% of nurses were in agreement with the scenario.

Of the 70 cases over triaged, 66 (94.3%) were within one category of the expected triage category and four (5.7%) were within two categories.

Table 3.15. Triage agreement for Paediatric Computer Based Scenario 4

Hospital	Agreement		Under triaged	Over triaged	
1	5	100%			
3	3	30%		7	70%
4	5	55.6%		4	44.4%
5	5	50%		5	50%
6	4	100%			
7	10	100%			
8	2	40%		3	60%
9	2	40%		3	60%
10				5	100%
11	2	33.3%		4	66.7%
12	9	100%			
13	2	40%		3	60%
15	9	100%			
16	2	22.2%		7	77.8%
17	2	40%		3	60%
18	2	40%		3	60%
19	2	40%		3	60%
20	1	20%		4	80%
21	3	60%		2	40%
22	4	80%		1	20%
23				5	100%
24	3	60%		2	40%
25	2	40%		3	60%
26	2	40%		3	60%
27	10	100%			
Total	91	56.5%		70	43.5%

3.4.4.5 Scenario 5 (Triage Category 2)

Ten-year-old male presents by ambulance with respiratory distress. He states that his asthma became “bad” while he was playing school sports and a schoolteacher accompanies him. He is sitting upright on the ambulance trolley with nebulised Salbutamol in progress.

His respiratory rate is 48 with moderate use of accessory muscles, he is speaking in short phrases and his oxygen saturation is 92%

His heart rate is 130 (regular), and his skin is pink, warm and dry

His tongue and mucous membranes are moist

His GCS is 14 (eyes open to speech)

He has no complaints of pain

His temperature is 37.8

He has a history of asthma for which he occasionally uses a Ventolin puffer

Table 3.16 indicates by hospital the frequency of agreement between the Paediatric Computer Based Scenario 5 and the triage nurse. Thirty-three percent of triage nurses agreed with the expected triage category for the scenario.

Of the 49 cases where under triaging took place and the six cases over triaged, all cases were within one category of the expected triage category.

Table 3.16. Triage agreement for Paediatric Computer Based Scenario 5

Hospital	Agreement		Under triaged		Over triaged	
1	5	100%				
3	6	60%	3	30%	1	10%
4	6	66.7%	3	33.3%		
5	4	40%	5	50%	1	10%
6	3	75%			1	25%
7	6	60%	4	40%		
8	3	60%	2	40%		
9	4	80%	1	20%		
10	5	100%				
11	4	66.7%	1	16.7%	1	16.7%
12	4	44.5%	5	55.6%		
13	4	80%	1	20%		
15	3	33.3%	6	66.7%		
16	9	100%				
17	4	80%	1	20%		
18	3	60%	2	40%		
19	2	40%	3	60%		
20	4	80%	1	20%		
21	3	60%			2	40%
22	3	60%	2	40%		
23	5	100%				
24	5	100%				
25	3	60%	2	20%		
26	3	60%	2	40%		
27	5	50%	5	50%		
Total	106	65.8%	49	30.4%	6	3.7%

3.4.4.6 Scenario 6 (Triage Category 1)

Twenty-month-old female presents by ambulance with a generalised (tonic - clonic) seizure. She has a one-day history of a febrile illness. On arrival she is still fitting and is in a lateral position on the ambulance trolley with oxygen at 8 L/min via a Hudson mask.

Her respiratory rate is unable to be measured and her oxygen saturation is 90%
 Her heart rate is 154 (regular) and her skin is pale, warm and dry with cyanosis of the lip margins
 Her tongue and mucous membranes are moist
 She is unresponsive as she is fitting
 Her temperature is 38.8
 She has a past history of a febrile convulsion 6 months ago.

Table 3.17 indicates by hospital the frequency of agreement between the Paediatric Computer Based Scenario 6 and the triage nurse. Eighty-five percent of the triage nurses agreed with the expected triage category for this scenario.

Of the 24 cases where under triaging took place, all cases were within one category of the expected triage category.

Table 3.17. Triage agreement for Paediatric Computer Based Scenario 6

Hospital	Agreement		Under triaged		Over triaged
1	5	100%			
3	7	70%	3	30%	
4	6	66.7%	3	33.3%	
5	7	70%	3	30%	
6	4	100%			
7	10	100%			
8	5	100%			
9	5	100%			
10	4	80%	1	20%	
11	6	100%			
12	9	100%			
13	4	80%	1	20%	
15	7	77.8%	2	22.2%	
16	9	100%			
17	5	100%			
18	5	100%			
19	3	60%	2	40%	
20	4	80%	1	20%	
21	5	100%			
22	5	100%			
23	5	100%			
24	5	100%			
25	3	60%	2	40%	
26	4	80%	1	20%	
27	5	50%	5	50%	
Total	137	85.1%	24	14.9%	

3.4.4.7 Scenario 7 (Triage Category 3)

Six-year-old female presents with his mother with a three-day history of febrile illness, respiratory distress and wheeze. Her mother carries her to the triage desk. Her mother states that she has asthma and has had increasing use of her Ventolin puffer over the last few days but with poor effect. Today she has been using her Ventolin puffer with a spacer two hourly.

Her respiratory rate is 38 with mild use of accessory muscles, she is able to speak in full sentences and her oxygen saturation on room air is 99%

Her heart rate is 110 (regular) and her skin is pale, warm and dry

Her GCS is 15

Her mother states she has had no complaints of pain

Her temperature is 38.5

Her only past medical history is asthma for which she uses a Ventolin puffer.

Table 3.18 indicates by hospital the frequency of agreement between the Paediatric Computer Based Scenario 7 and the triage nurse. Nearly sixty-nine percent of triage nurses agreed with the expected triage category of this scenario.

Of the 46 cases where under triaging took place, 45 cases were under triaged within one category of the expected triage category and one was triaged within two categories. Of the 15 cases over triaged, all were within one category of the expected triage category.

Table 3.18. Triage agreement for Paediatric Computer Based Scenario 7

Hospital	Agreement		Under triaged		Over triaged	
1	3	60%			2	40%
3	4	40%	6	60%		
4	7	77.8%	2	22.2%		
5	6	60%	3	30%	1	10%
6	1	25%	1	25%	2	50%
7	6	60%	4	40%		
8	3	60%	2	40%		
9	2	40%	2	40%	1	20%
10	4	80%			1	20%
11	3	50%	1	16.7%	2	33.3%
12	5	55.6%	3	33.3%	1	11.1%
13	4	80%			1	20%
15	5	55.6%	4	44.4%		
16	6	66.7%			3	33.3%
17	4	80%	1	20%		
18	4	80%	1	20%		
19	4	80%	1	20%		
20	3	60%	2	40%		
21	4	80%	1	20%		
22	3	60%	2	40%		
23	4	100%				
24	5	100%				
25	3	60%	2	40%		
26	5	100%				
27	2	20%	8	80%		
Total	99	61.9%	46	28.8%	15	9.4%

3.4.5 Adult paper based scenarios

3.4.5.1 Scenario 1 (Triage Category 5)

Twenty-three year old female presents with one-day history of PV bleeding. She is able to walk to the triage desk unassisted. She states she is eight weeks pregnant and has had “spotting” since this morning. She described her PV loss as a “few bright spots”.

Her respiratory rate is 16 with no use of accessory muscles and her oxygen saturation is 98%

Her heart rate is 78 and her skin is pale, warm and dry

Her blood pressure is 120/80

She has changed her pad once today

Her GCS is 15

She does not complain of any pain

She has no relevant past medical history.

Table 3.19 indicates by hospital the frequency of agreement between the Adult Paper Based Scenario 1 and the triage nurse. Nearly twenty-one percent of triage nurses agreed with the expected triage category with this scenario.

Of the 131 cases over triaged, 116 were within one category of the expected triage category. Fifteen were within two categories of the expected triage category.

Table 3.19. Triage agreement for Adult Paper Based Scenario 1

Hospital	Agreement		Under triaged	Over triaged	
1	1	20%		4	80%
2				8	100%
3				10	100%
4	2	22.2%		7	77.8%
5	1	10%		9	90%
6	4	100%			
7	1	10%		9	90%
8	2	40%		3	60%
9				5	100%
10				5	100%
11	5	83.3%		1	16.7%
12	5	62.5%		3	37.5%
13				5	100%
14				8	100%
15	7	77.8%		2	22.2%
16				8	100%
17				5	100%
18	1	20%		4	80%
19				5	100%
20				5	100%
21	1	20%		4	80%
22	2	40%		3	60%
23				5	100%
24	1	20%		4	80%
25	1	20%		4	4 (80%)
26				5	100%
Total	34	20.6%		131	79.4%

3.4.5.2 Scenario 2 (Triage Category 2)

Eighty-two year old female presents with her daughter following a collapse at home. She is unable to walk and requires assistance to get out of the car. She is brought to the triage desk in a wheelchair. The patient's daughter tells you that her mother has been feeling unwell for 2 days and was nauseated with vomiting today. She collapsed in the lounge room as she got up from a chair and was unconscious for 1 - 2 minutes.

Her respiratory rate is 20 with no use of accessory muscles and her oxygen saturation is 97%

Her heart rate is 148 (irregular), and her skin is pale, cool and moist

Her blood pressure is 90/55

Her GCS is 13 (eyes open to speech, confused to place and time)

She has no complaints of pain but states she feels dizzy

Her temperature is 37.4

She has a history of ischaemic heart disease, non insulin dependent diabetes and congestive cardiac failure. Her daughter has brought her medications with her and she takes Daonil, Digoxin, Warfarin, Frusemide and Slow K potassium supplement. She has had all of her usual medications today.

Table 3.20 below indicates by hospital the frequency of agreement between the Adult Paper Based Scenario 2 and the triage nurse. Approximately seventy percent were in agreement with this scenario. Of the 45 cases where under triaging took place and of the six cases over triaged, all were within one category of the expected triage category.

Table 3.20. Triage agreement for Adult Paper Based Scenario 2

Hospital	Agreement		Under triaged		Over triaged	
1	5	100%				
2	7	87.5%			1	12.5%
3	5	50%	4	40%	1	10%
4	2	22.2%	7	77.8%		
5	7	70%	3	30%		
6	2	50%	2	50%		*
7	6	60%	3	30%	1	10%
8	1	20%	4	80%		
9	5	100%				
10	3	60%			2	40%
11	2	33.3%	4	66.7%		
12	8	88.9%	1	11.1%		
13	3	60%	2	40%		
14	7	87.5%	1	12.5%		
15	6	66.7%	3	33.3%		
16	9	100%				
17	3	60%	2	40%		
18	3	60%	2	40%		
19	4	80%	1	20%		
20	3	60%	2	40%		
21	5	100%				
22	4	80%			1	20%
23	3	60%	2	40%		
24	5	100%				
25	4	80%	1	20%		
26	4	80%	1	20%		
Total	116	69.5%	45	26.9%	6	3.6%

3.4.5.3 Scenario 3 (Triage Category 3)

Seventy-eight year old female presents with her daughter who reports a three-day history of increasing shortness of breath, fevers and lethargy. The patient is able to walk to the triage desk unassisted.

Her respiratory rate is 28 with mild use of accessory muscles, she is able to speak in full sentences and her oxygen saturation on room air is 92%

Her heart rate is 120 (irregular) and her skin is pink, hot and dry

Her blood pressure is 145/90

Her GCS is 14 (confused to time and place)

She is complaining of right sided back pain 6/10 that is present only on deep inspiration and coughing

Her temperature is 38.5

She describes a productive cough with green sputum. She has a past history of non insulin dependent diabetes for which she takes Daonil.

Table 3.21 indicates by hospital the frequency of agreement between the Adult Paper Based Scenario 3 and the triage nurse. Nearly seventy-five percent of nurses were in agreement with the expected triage scenario.

Of the 17 cases where under triaging took place, and of the 25 cases over triaged, all were within one category of the expected triage category.

Table 3.21. Triage agreement for Adult Paper Based Scenario 3

Hospital	Agreement		Under triaged		Over triaged	
1	4	80%	1	20%		
2	6	75%			2	25%
3	8	80%			2	20%
4	6	66.7%	3	33.3%		
5	9	90%			1	10%
6	2	50%	2	50%		
7	7	70%			3	30%
8	1	20%	3	60%	1	20%
9	5	100%				
10	3	60%	1	20%	1	20%
11	2	33.3%	1	16.7%	3	50%
12	6	66.7%	1	11.1%	2	22.2%
13	4	80%			1	20%
14	6	75%	2	25%		
15	6	66.7%	3	33.3%		
16	7	77.8%			2	22.2%
17	3	60%	2	40%		
18	5	100%				
19	5	100%				
20	5	100%				
21	3	60%			2	40%
22	5	100%				
23	3	60%			2	40%
24	4	80%			1	20%
25	2	50%			2	50%
26	5	100%				
Total	124	74.7%	17	10.2%	25	15.1%

3.4.5.4 Scenario 4 (Triage Category 1)

Thirty-five year old female presents by ambulance with one-day history of increasing respiratory distress. On arrival she is sitting upright on the ambulance trolley with nebulised Salbutamol in progress.

Her respiratory rate is 36 with severe use of accessory muscles, she is unable to speak and her oxygen saturation is 88%

Her heart rate is 135 (regular) and her skin is pale, cold and moist

Her blood pressure is 140/85

Her GCS is 14 (eye opening to speech)

Her temperature is 37.8

She has a past history of asthma.

Table 3.22 indicates by hospital the frequency of agreement between the Adult Paper Based Scenario 4 and the triage nurse. Thirty-nine percent of triage nurses were in agreement with the expected triage category of the scenario.

Of the 101 cases where under triaging took place, 95 were under triaged within one category of the expected triage category and six cases were triaged within two categories.

Table 3.22. Triage agreement for Adult Paper Based Scenario 4

Hospital	Agreement		Under triaged		Over triaged
1	3	60%	2	40%	
2	7	87.5%	1	12.5%	
3	5	50%	5	50%	
4	4	44.4%	5	55.6%	
5	3	30%	7	70%	
6			4	100%	
7	3	30%	7	70%	
8	2	40%	3	60%	
9	2	40%	3	60%	
10	2	40%	3	60%	
11	2	33.3%	4	66.7%	
12	3	33.3%	6	66.6%	
13	1	20%	4	80%	
14	5	62.5%	3	37.5%	
15	3	33.3%	6	66.7%	
16	1	11.1%	8	88.9%	
17	1	20%	4	80%	
18			5	100%	
19	3	60%	2	40%	
20	2	40%	3	60%	
21	5	100%			
22	2	40%	3	60%	
23	2	40%	3	60%	
24	1	20%	4	80%	
25	2	40%	3	60%	
26	2	40%	3	60%	
Total	66	39.5%	101	60.5%	

3.4.5.5 Scenario 5 (Triage Category 4)

Fifty-year-old male presents with a workmate with a laceration to his right hand. He is able to walk to the triage desk unassisted. He was using an electric saw and has a 4cm laceration to his right index finger.

His respiratory rate is 22 with no use of accessory muscles and his oxygen saturation is 99%

His heart rate is 68 (regular), and his skin is pale, cool and dry

His blood pressure is 135/85

His GCS is 15

He is complaining of pain in his finger 3/10

He is unable to move his right index finger and complains of altered sensation to the finger tip

His laceration is not bleeding

His temperature is 36.5

He has no relevant past medical history.

Table 3.23 displays the frequency of agreement between the Adult Paper Based Scenario 5 and the triage nurse, for each hospital. Nearly fifty percent of nurses agreed with the scenario. Of the 11 cases where under triaging took place, all were within one category of the expected triage category. Of the 73 cases over triaged, 71 were within one category of the expected triage category and two were within two categories.

Table 3.23. Triage agreement for Adult Paper Based Scenario 5

Hospital	Agreement		Under triaged		Over triaged	
1	1	20%			4	80%
2	6	75%			2	25%
3	4	40%			6	60%
4	6	66.7%			3	33.3%
5	6	60%			4	40%
6	2	50%	2	50%		
7	4	40%	1	10%	5	50%
8	1	20%	1	20%	3	60%
9	3	60%			2	40%
10					5	100%
11	2	33.3%	1	16.7%	3	50%
12	6	66.7%	1	11.1%	2	22.2%
13	1	20%			4	80%
14	3	37.5%	1	12.5%	4	50%
15	6	66.7%	1	11.1%	2	22.2%
16	9	100%				
17	1	20%			4	80%
18	2	40%			3	60%
19	4	80%			1	20%
20	3	60%			2	40%
21	2	40%			3	60%
22	2	40%	2	40%	1	20%
23	2	40%			3	60%
24	2	40%	1	20%	1	20%
25	4	80%			1	20%
26	1	20%			4	80%
Total	83	49.7%	11	6.6%	73	43.7%

3.4.5.6 Scenario 6 (Triage Category 4)

Thirty-year-old female presents with a one-day history of vomiting, diarrhoea and abdominal pain. She is able to walk to the triage desk unassisted and she states that her symptoms were of sudden onset.

Her respiratory rate is 16 with no use of accessory muscles and her oxygen saturation is 98%

Her heart rate is 88 and her skin is pale, warm and dry

Her blood pressure is 110/85

Her GCS is 15

She is complaining of generalised abdominal pain 4/10

She states that she has not vomited for 4 hours but continues to have diarrhoea. She is tolerating small amounts of oral fluid. She has a past history of asthma for which she uses a Ventolin puffer.

Table 3.24 indicates by hospital the frequency of agreement between the Adult Paper Based Scenario 6 and the triage nurse. Nearly seventy-seven percent of nurses agreed with the scenario.

Of the 22 cases where under triaging took place and the 16 cases over triaged, all were under triaged within one category of the expected triage category.

Table 3.24. Triage agreement for Adult Paper Based Scenario 6

Hospital	Agreement		Under triaged		Over triaged	
1	5	100%				
2	5	62.5%			3	37.5%
3	10	100%				
4	7	77.8%	2	22.2%		
5	8	80%	1	10%	1	10%
6	1	25%	3	75%		
7	9	90%	1	10%		
8	2	40%	2	40%	1	20%
9	5	100%				
10	5	100%				
11	4	66.7%	2	33.3%		
12	7	77.8%	2	22.2%		
13	4	80%			1	20%
14	8	100%				
15	5	55.6%	4	44.4%		
16	8	88.9%	1	11.1%		
17	4	80%			1	20%
18	4	80%			1	20%
19	5	100%				
20	5	100%				
21	3	60%	1	20%	1	20%
22	1	20%	2	40%	2	40%
23	4	80%			1	20%
24	3	60%	1	20%	1	20%
25	4	80%			1	20%
26	3	60%	1	20%	1	20%
Total	129	77.2%	22	13.2%	16	9.6%

3.4.5.7 Scenario 7 (Triage Category 3)

Sixty-eight year old male presents by ambulance following collapse at the shopping centre. On arrival he is in a semi-recumbent position on the ambulance trolley. His wife tells you that he became pale, complained of feeling dizzy and then fell to the ground. His wife states that he was unconscious for “a few seconds”.

His respiratory rate is 16 with no use of accessory muscles, he is able to speak in full sentences and his oxygen saturation on room air is 96%

His heart rate is 56 (irregular) and his skin is pale, warm and dry

His blood pressure is 140/85

His GCS is 13 (eyes open to speech and confused to time and place)

He has no complaints of pain

His temperature is 37.8

He tells you that he did not have any chest pain or headache prior to his collapse. He has a past history of COAD and a “cardiac complaint”. His medications are Digoxin, Frusemide, Potassium supplements and the occasional Anginine.

Table 3.25 indicates by hospital the frequency of agreement between the Adult Paper Based Scenario 7 and the triage nurse. Nearly sixty-four percent of nurses agreed with the expected category of the scenario. Of the 9 cases where under triaging took place, and 50 that were over triaged, all were within one category of the expected triage category. One case was over triaged within two categories.

Table 3.25. Triage agreement for Adult Paper Based Scenario 7

Hospital	Agreement		Under triaged		Over triaged	
1	3	60%			2	40%
2	3	37.5%			5	62.5%
3	6	60%	1	10%	3	30%
4	7	77.8%	2	22.2%		
5	4	40%			6	60%
6	4	100%				
7	6	60%	1	10%	3	30%
8	3	60%			2	40%
9	3	60%	1	20%	1	20%
10	3	60%			2	40%
11	3	50%	1	16.7%	2	33.3%
12	6	66.7%	1	11.1%	2	22.2%
13	4	80%			1	20%
14	6	75%			2	25%
15	5	55.6%	2	22.2%	2	22.2%
16	7	77.8%			2	22.2%
17	5	100%				
18	3	60%			2	40%
19	4	80%			1	20%
20	5	100%				
21					5	100%
22	3	60%			2	40%
23	4	80%			1	20%
24	3	60%			2	40%
25	3	60%			2	40%
26	4	80%			1	20%
Total	107	64.1%	9	5.4%	51	30.5%

3.4.6 Paediatric paper based scenarios

3.4.6.1 Scenario 1 (Triage Category 4)

Four-year-old male presents with his parents with a laceration to his top lip. He is able to walk to the triage desk holding onto his mother's hand. His mother tells you he collided with another child at playgroup. The childcare worker witnessed the event and there was no loss of consciousness.

His respiratory rate is 20 with no use of accessory muscles, he is speaking in sentences and his oxygen saturation is 98%

His heart rate is 86 and his skin is pink, warm and dry

His laceration is 2 - 3 cm in length with swelling around the laceration, it has a slow trickle of blood and the edges are jagged

He is alert but clinging to his mothers leg and he is crying but consolable by his mother

He complains of pain in his top lip and cries when you place a dressing over the laceration

His temperature is 37.1

He has a past medical history of recurrent tonsillitis

Table 3.26 indicates by hospital the frequency of agreement between the Paediatric Paper Based Scenario 1 and the triage nurse. Nearly seventy-one percent of nurses were in agreement with the scenario. Of the 19 cases where under triaging took place, and 27 cases over triaged, all cases were within one category of the expected triage category. One case over triaged was within two categories.

Table 3.26. Triage agreement for Paediatric Paper Based Scenario 1

Hospital	Agreement		Under triaged		Over triaged	
1	3	60%	1	20%	1	20%
3	6	60%	2	20%	2	20%
4	7	77.8%	1	11.1%	1	11.1%
5	9	90%			1	10%
6	1	25%	3	75%		
7	7	70%	2	20%	1	10%
8	4	80%			1	20%
9	4	80%			1	20%
10	3	60%			2	40%
11	5	83.3%			1	16.7%
12	6	66.7%	1	11.1%	2	22.2%
13	33	60%			2	40%
15	3	33.3%	5	55.6%	1	11.1%
16	4	44.4%	1	11.1%	4	44.4%
17	4	80%			1	20%
18	5	100%				
19	5	100%				
20	4	80%			1	20%
21	2	40%			3	60%
22	5	100%				
23	4	80%			1	20%
24	3	60%	2	40%		
25	5	100%				
26	5	100%				
27	7	70%	1	10%	2	20%
Total	114	70.8%	19	11.8%	28	17.4%

3.4.6.2 Scenario 2 (Triage Category 3)

Nine-year-old female presents with her mother with a painful left forearm. Her mother states she was roller-blading in the backyard when she fell. The patient is able to walk to the triage desk unassisted and is holding her left arm.

Her respiratory rate is 16 with no use of accessory muscles, she is able to speak in full sentences and her oxygen saturation on room air is 99%

Her heart rate is 90 (regular) and her skin is pink, warm and dry

Her GCS is 15

She is complaining of a painful left forearm and indicates that her pain equates to 6/10 on a pain scale

Her arm is slightly deformed with decreased range of movement, and the neurovascular status of her left hand is normal

Her temperature is 36.5

She has no relevant past medical history.

Table 3.27 indicates by hospital the frequency of agreement between the Paediatric Paper Based Scenario 2 and the triage nurse. Sixty-four percent of nurses were in agreement with the scenario.

Of the 51 cases where under triaging took place and of the seven cases over triaged, all cases were within one category of the expected triage category.

Table 3.27. Triage agreement for Paediatric Paper Based Scenario 2

Hospital	Agreement		Under triaged		Over triaged	
1	2	40%	2	40%	1	20%
3	4	40%	6	60%		
4	8	88.9%	1	11.1%		
5	8	80%	2	20%		
6	2	50%	2	50%		
7	9	90%	1	10%		
8	3	60%	2	40%		
9	4	80%	1	20%		
10	3	60%	2	40%		
11	1	16.7%	4	66.7%	1	16.7%
12	4	44.4%	5	55.6%		
13	2	40%	1	20%	1	20%
15	4	44.4%	4	44.4%	1	11.1%
16	5	55.6%	3	33.3%	1	11.1%
17	3	60%	2	40%		
18	3	60%	2	40%		
19	5	100%				
20	5	100%				
21	4	80%			1	20%
22	3	60%	2	40%		
23	5	100%				
24	3	60%	2	40%		
25	4	80%	1	20%		
26	2	40%	3	60%		
27	7	70%	3	30%		
Total	103	64%	51	31.7%	7	4.3%

3.4.6.3 Scenario 3 (Triage Category 1)

Four-year-old male presents with his parents with a one-day history of increasing respiratory distress. His father carries him to the triage desk. His father states his son has had a dry barking cough for two days and coughed most of the night.

He has an audible stridor

His respiratory rate is 68 with severe use of accessory muscles, he is unable to speak and his oxygen saturation is 96%

His heart rate is 178 (regular) and his skin is pale, cold and moist

His tongue and mucous membranes are moist

He is drowsy but responsive to verbal stimuli

His temperature is 38.6

He has no relevant medical past history

Table 3.28 displays the frequency of agreement between the Paediatric Computer Based Scenario 3 and the triage nurse, for each hospital. Nearly thirty-five percent of nurses were in agreement with the scenario.

Of the 105 cases where under triaging took place, 15 cases were within one category of the expected triage category and one case was within two categories.

Table 3.28. Triage agreement for Paediatric Paper Based Scenario 3

Hospital	Agreement		Under triaged		Over triaged
1	3	60%	2	40%	
3	5	50%	5	50%	
4	2	22.2%	7	77.8%	
5	4	40%	6	60%	
6	2	50%	2	50%	
7	5	50%	5	50%	
8	1	20%	4	80%	
9			5	100%	
10	2	40%	3	60%	
11	4	66.7%	2	33.3%	
12	4	44.4%	5	55.6%	
13	1	20%	4	80%	
15	1	11.1%	8	88.9%	
16	5	55.6%	4	44.4%	
17	2	40%	3	60%	
18	2	40%	3	60%	
19	1	20%	4	80%	
20	2	40%	3	60%	
21	2	40%	3	60%	
22	2	40%	3	60%	
23	2	40%	3	60%	
24	1	20%	4	80%	
25	2	40%	3	60%	
26			5	100%	
27	1	10%	9	90%	
Total	56	34.8%	105	65.2%	

3.4.6.4 Scenario 4 (Triage Category 5)

Eighteen-month-old male presents with his father with a laceration to the back of his head. He is able to walk to the triage desk holding his father's hand. His father states that he was hit on the head when an older sibling threw a toy at him. The patient's father witnessed the incident and there was no loss of consciousness.

His respiratory rate is 20 with no use of accessory muscles and his oxygen saturation is 98%

His heart rate is 96 and his skin is pink, warm and dry

His laceration is 2 cm in length, is not bleeding and the edges are well approximated

He is alert and chasing his older sibling around the waiting room

He is not complaining of any pain

He has no relevant past medical history.

Table 3.29 indicates by hospital the frequency of agreement between the Paediatric Paper Based Scenario 4 and the triage nurse. Nearly 33% of nurses were in agreement with the scenario.

Of the 108 cases over triaged, 99 were within 1 category of the expected triage category and 9 cases were within two categories.

Table 3.29. Triage agreement for Paediatric Paper Based Scenario 4

Hospital	Agreement		Under triaged	Over triaged	
1	3	60%		2	40%
3	3	30%		7	70%
4				9	100%
5	2	20%		8	80%
6	3	75%		1	25%
7	3	30%		7	70%
8	3	60%		2	40%
9				5	100%
10				5	100%
11	2	33.3%		4	66.7%
12	6	66.7%		1	33.3%
13				5	100%
15	7	77.8%		2	22.2%
16	1	11.1%		8	88.9%
17	2	40%		3	60%
18	2	40%		3	60%
19				5	100%
20	1	20%		4	80%
21	3	60%		2	40%
22	3	60%		2	40%
23				5	100%
24	2	40%		3	60%
25				5	100%
26	1	20%		4	80%
27	6	60%		4	40%
Total	53	32.9%		108	67.1%

3.4.6.5 Scenario 5 (Triage Category 4)

Eight-month-old male presents with his parents with a one-day history of febrile illness and cough. His mother carries him to the triage desk. He has a moist sounding cough and a runny nose.

His respiratory rate is 24 with no use of accessory muscles, he is making “baby talk” noises and his oxygen saturation is 98%

His heart rate is 112 and his skin is pink, warm and dry

He is alert but cries when you approach him

His tongue and mucous membranes are moist

His temperature is 38.4

He has no past medical history.

Table 3.30 indicates by hospital the frequency of agreement between the Paediatric Paper Based Scenario 5 and the triage nurse. Sixty-five percent of nurses were in agreement with the scenario.

Of the 22 cases where under triaging took place, all cases were under triaged within one category of the expected triage category. Of the 34 cases over triaged, 33 were within one category of the expected triage category and one case was within two categories.

Table 3.30. Triage agreement for Paediatric Paper Based Scenario 5

Hospital	Agreement		Under triaged		Over triaged	
1	5	100%				
3	8	80%			2	20%
4	8	88.9%	1	11.1%		
5	9	90%			1	10%
6	1	25%	2	50%	1	25%
7	9	90%	1	10%		
8	4	80%	1	20%		
9	2	40%	1	20%	2	40%
10	3	60%			2	40%
11	2	33.3%	1	16.7%	3	50%
12	4	44.4%	5	55.6%		
13	2	40%			3	60%
15	5	55.6%	4	44.4%		
16	4	44.4%			5	55.6%
17	4	80%			1	20%
18	4	80%			1	20%
19	5	100%				
20	5	100%				
21	4	80%			1	20%
22	2	40%	2	40%	1	20%
23					5	100%
24	2	40%	2	40%	1	20%
25	3	60%			2	40%
26	3	60%			2	40%
27	6	66.7%	2	22.2%	1	11.1%
Total	104	65%	22	13.8%	34	21.3%

3.4.6.6 Scenario 6 (Triage Category 3)

Four-year-old female presents with her parents following a one-day history of febrile illness and witnessed generalised (tonic - clonic) seizure. Her mother carries her to the triage desk. Her mother states she has had “fevers all day” and had a “fit” about thirty minutes ago. Her mother states that the seizure lasted two - three minutes and resolved spontaneously. The patient was unresponsive during the seizure but did not change colour and did not injure herself.

Her respiratory rate is 22 with no use of accessory muscles, she cries when you approach her and her oxygen saturation is 99%

Her heart rate is 132 (regular), and her skin is pink, hot and dry

Her tongue and mucous membranes are moist

She opens her eyes to speech and is irritable but consolable by her mother

Her mother states she complained of a sore throat last night and has been complaining of a “sore head” since her fit

Her temperature is 39.0

She has a past medical history of febrile convulsions.

Table 3.31 indicates by hospital the frequency of agreement between the Paediatric Paper Based Scenario 6 and the triage nurse. Fifty-seven percent of nurses were in agreement with the scenario.

Of the 14 cases where under triaging took place, all cases were under triaged within one category of the expected triage category. Of the 55 cases over triaged, 52 were within one category of the expected triage category and three cases were within two categories.

Table 3.31. Triage agreement for Paediatric Paper Based Scenario 6

Hospital	Agreement		Under triaged		Over triaged	
1	2	40%			3	60%
3	6	60%	2	20%	2	20%
4	8	88.9%	1	11.1%		
5	7	70%			3	30%
6	3	75%			1	25%
7	7	70%			3	30%
8	2	40%			3	60%
9	4	80%			1	20%
10	3	60%			2	40%
11			1	16.7%	5	83.3%
12	6	66.7%	1	11.1%	2	22.2%
13	1	20%			4	80%
15	5	55.6%	4	44.4%		
16	2	22.2%			7	77.8%
17	4	80%			1	20%
18	5	100%				
19	3	60%			2	40%
20	5	100%				
21	1	20%			4	80%
22	2	40%			3	60%
23	3	60%			2	40%
24	3	60%			2	40%
25	2	40%			3	60%
26	4	80%			1	20%
27	4	40%	5	50%	1	10%
Total	92	57.1%	14	8.7%	55	34.2%

3.4.6.7 Scenario 7 (Triage Category 2)

Two-year-old male presents with his parents following a fall from the kitchen table. His mother carries him to triage desk. His parents state that he had climbed up onto the table and was standing on the table when he fell landing on a wooden floor. His mother witnessed the fall and states there was a loss of consciousness for a “few minutes”. He has been unable to walk and has vomited three times since the fall.

His respiratory rate is 28 with no use of accessory muscles, he is not speaking but cries intermittently and his oxygen saturation is 96%

His heart rate is 140 (regular), and his skin is pale, cool and moist

His tongue and mucous membranes are moist

He is responsive to painful stimuli

He is unable to verbalise where the pain is but is holding his head and crying inconsolably

He has a palpable haematoma to the right side of his head

His temperature is 36.4

He has no relevant past medical history.

Table 3.32 indicates by hospital the frequency of agreement between the Paediatric Paper Based Scenario 7 and the triage nurse. Fifty-five nurses were in agreement with the scenario.

Of the 46 cases where under triaging took place, 44 cases were within one category of the expected triage category and two cases were within two categories. Of the 26 cases over triaged, all were within one category of the expected triage category.

Table 3.32. Triage agreement for Paediatric Paper Based Scenario 7

Hospital	Agreement		Under triaged		Over triaged	
1	3	60%	1	20%	1	20%
3	4	40%	5	50%	1	10%
4	6	66.7%	3	33.3%		
5	4	40%	4	40%	2	20%
6	1	25%	3	75%		
7	4	40%	3	30%	3	30%
8	4	80%	1	20%		
9	2	40%	3	60%		
10	2	40%	2	40%	1	20%
11	3	50%			3	50%
12	6	66.7%			3	33.3%
13	3	60%	1	20%	1	20%
15	4	44.4%	5	55.6%		
16	6	66.7%	2	22.2%	1	11.1%
17	3	60%			2	40%
18	3	60%	1	20%	1	20%
19	5	100%				
20	5	100%				
21	3	60%			2	40%
22	3	60%	1	20%	1	20%
23	2	40%	2	40%	1	20%
24	2	40%	3	60%		
25	2	40%	1	20%	2	40%
26	3	60%	1	20%	1	20%
27	5	55.6%	4	44.4%		
Total	88	55%	46	28.8%	26	16.3%

3.4.7 Summary of case scenario results

Table 3.33 summarises the distribution of percentages of correctly triaged scenarios according to mode of test delivery (computer versus paper) and population focus (paediatric or adult). Participants had higher mean scores when tested using a computer compared to paper-based tests. The difference in scores (about 8% in adult scenarios and 14% in paediatric scenarios) was highly statistically significant. Subsequent analyses will compare these four groups separately.

Table 3.33. Summary of correctly triaged case scenario results

Scenario and mode of delivery	Mean	Standard deviation	Computer vs paper
Adult			
Computer	64.63%	16.39%	<0.001
Paper	56.46%	16.75%	
Paediatric			
Computer	67.81%	20.16%	<0.001
Paper	54.14%	19.85%	

Table 3.34 shows the correlations between correct answers and selected characteristics of the participants by mode of delivery and population studies. Overall, negative trends were apparent although extremely weak, and no consistent, statistically significant results were found.

Table 3.34. Correlation between triage agreement and participant characteristics

Scenario and mode of delivery	Age, years	ED experience, months	Triage experience, months	Time in current position, months
Adult				
Computer	-0.1311	-0.1393	-0.1433	-0.0695
Paper	-0.0783	-0.0753	-0.0227	-0.0585
Paediatric				
Computer	-0.1885	-0.1457	-0.1284	-0.0786
Paper	-0.0715	-0.0937	-0.0811	-0.1633

Table 3.35 displays the relationship between the participants' characteristics and the correct responses. Although there were no differences in the test performance within a specific population and mode of delivery combination according to subject characteristics, subjects consistently performed better when the test was administered via the computer. These differences were often in the ten percent range but some characteristics were associated with differences approaching twenty percent.

Table 3.35. Relationship between participant characteristics and test results

Characteristics		Adult Scenarios		Paediatric Scenarios	
		Computer	Paper	Computer	Paper
Sex	Male	66.92%	53.38%	70.54%	57.14%
	Female	64.33%	56.86%	67.51%	53.82%
Hospital group:	A1	69.84%	59.05%	67.03%	52.38%
	A2	62.56%	57.64%	64.53%	51.48%
	B	62.86%	53.63%	71.21%	57.58%
Current position:	RN	65.52%	54.86%	70.02%	54.32%
	CNS	65.31%	62.04%	71.43%	57.14%
	ACN	62.37%	55.75%	64.78%	54.82%
	NUM	62.50%	55.36%	60.71%	42.86%
	Other	64.28%	59.52%	61.90%	50.00%
General qualifications:	Yes	63.31%	55.79%	65.41%	55.34%
	No	66.27%	57.54%	71.21%	52.38%
Hospital certificates	Yes	66.19%	56.82%	70.59%	53.28%
	No	62.71%	56.22%	64.66%	55.08%
Undergraduate degrees	Yes	64.60%	56.72%	68.50%	53.77%
	No	64.50%	55.84%	65.13%	55.46%
Postgraduate degrees	No	64.50%	55.84%	65.13%	55.46%

3.4.8 Regression analysis

For the regression analysis, an automatic stepwise procedure was avoided by modelling the determinants of test performance from a list of nurse and/or hospital characteristics. The covariates (nurse demographics [age, gender, current position and experience] and hospital characteristics [hospital group]) were added into increasingly specified models (Models 1, 2 & 3) until estimates derived from a fully specified model (Model 3) were achieved.

The base model (Model 1) controlled for the general nurse demographic variables of age and sex. In Model 2, an additional environmental variable (hospital group "A1, A2 & B") was proscribed. The full model, represented by Model 3, included covariates indicating experience: current position and general experience in emergency department and triage settings. The results are displayed in Table 3.36 to Table 3.39.

Table 3.36 displays the multivariate regression of performance on Adult Computer Based Scenarios on various sets of covariates. Results are given as regression coefficients and standard errors, except those referring to model characteristics.

Table 3.36. *Multivariable regression on Adult Computer Based Scenarios*

Characteristics		Model 1	Model 2	Model 3
R ² , %		2.17	3.99	5.62
Constant		76.44 (6.90) ^{***}	76.44 (6.89) ^{***}	76.36 (8.18) ^{***}
Age (per year)		-0.25 (0.17)	-0.16 (0.18)	-0.12 (0.25)
Female (versus male)		-3.43 (4.20)	-3.29 (4.25)	-3.24 (4.46)
Hospital group (versus A1)	A2		-4.51 (3.39)	4.97 (3.62)
	B		-5.44 (3.47)	-5.48 (3.69)
Current position (versus "RN")	CNS			1.54 (3.75)
	ACN			-0.35 (4.12)
	NUM			0.56 (6.38)
	Other			-1.34 (7.59)
Experience (per month)	ED experience			0.04 (0.05)
	Triage experience			0.01 (0.05)
	Time in current position			0.02 (0.04)

*** p≤0.001

Table 3.37 displays the multivariate regression of performance on Adult Paper Based Scenarios on various sets of covariates. Results are given as regression coefficients and standard errors, except those referring to model characteristics.

Table 3.37. *Multivariable regression on Adult Paper Based Scenarios*

Characteristics		Model 1	Model 2	Model 3
R ² , %		1.04	2.63	6.98
Constant		60.59 (7.35) ^{**}	60.31 (7.35) ^{**}	63.07 (8.45) ^{**}
Age (per year)		-0.18 (0.18)	-0.11 (0.19)	-0.26 (0.26)
Female (versus male)		3.52 (4.47)	2.57 (4.53)	2.64 (4.60)
Hospital group (versus A1)	A2		0.64 (3.62)	-0.54 (3.74)
	B		-4.16 (3.70)	-5.28 (3.81)
Current position (versus "RN")	CNS			6.90 (3.87)
	ACN			4.01 (4.25)
	NUM			2.39 (6.59)
	Other			8.27 (7.84)
Experience (per month)	ED experience			-0.04 (0.05)
	Triage experience			0.05 (0.05)
	Time in current position			0.01 (0.04)

** p≤0.001

Table 3.38 displays the multivariate regression of performance on Paediatric Computer Based Scenarios on various sets of covariates. Results are given as regression coefficients and standard errors, except those referring to model characteristics.

Table 3.38. *Multivariable regression on Paediatric Computer Based Scenarios*

Characteristics		Model 1	Model 2	Model 3
R ² , %		3.76	5.63	9.13
Constant		88.15 (9.34)**	87.41 (9.43)**	94.23 (10.77)**
Age (per year)		-0.48 (0.21)*	-0.55 (0.22)*	-0.73 (0.31)*
Female (versus male)		-3.20 (5.87)	-1.47 (5.96)	-2.35 (6.07)
Hospital group (versus A1)	A2		-0.70 (4.38)	-2.40 (4.61)
	B		5.48 (4.48)	6.19 (4.66)
Current position (versus "RN")	CNS			-0.66 (4.94)
	ACN			-5.05 (4.91)
	NUM			-7.90 (7.92)
	Other			-4.02 (9.50)
Experience (per month)	ED experience			0.03 (0.06)
	Triage experience			-0.01 (0.06)
	Time in current position			0.01 (0.04)

* p<0.05, ** p<0.001

Table 3.39 displays the multivariate regression of performance on Paediatric Paper Based Scenarios on various sets of covariates. Results are given as regression coefficients and standard errors, except those referring to model characteristics.

Table 3.39. *Multivariable regression on Paediatric Paper Based Scenarios*

Characteristics		Model 1	Model 2	Model 3
R ² , %		1.05	3.11	7.14
Constant		65.07 (9.04)**	64.23 (9.12)**	63.95 (10.44)**
Age (per year)		-0.16 (0.21)	-0.24 (0.21)	-0.20 (0.30)
Female (versus male)		-4.98 (5.68)	-3.26 (5.75)	-3.41 (5.89)
Hospital group (versus A1)	A2		-0.37 (4.24)	0.16 (4.47)
	B		5.71 (4.33)	6.67 (4.52)
Current position (versus "RN")	CNS			0.57 (4.79)
	ACN			-0.87 (4.76)
	NUM			-13.71 (7.68)
	Other			3.03 (9.21)
Experience (per month)	ED experience			-0.01 (0.06)
	Triage experience			0.03 (0.06)
	Time in current position			-0.05 (0.04)

** p<0.001

Overall, varying the level of adjustment for various covariates did not serve to identify statistically significant predictors of performance. The following specific findings were noted:

All models consistently explained less than 10 percent of the variability in test performance.

The effect of age was consistently negative, implying an inverse relationship between the covariate and test performance.

There was a consistent, non-statistically significant propensity for females to have a lower mean score than males. The absolute gender-specific difference was usually less than five percentage points between the two and it is questionable whether it is of clinical significance.

The differences in terms of hospital group and current position were extremely variable to amount to any identifiable pattern.

3.5 Conclusion

A total of 178 participants took part in the case scenario arm of this project. The participants were predominantly female by a ratio of 8:1 and the average age for all participants was 36 years. About 80% had some type of post-graduate qualification. Approximately 40% had completed either a graduate certificate in emergency nursing (28%) or graduate diploma in emergency nursing (13%).

Comparisons by gender (males versus females) indicated there were no age, current position or general qualification differences. However, comparisons using hospital groups (A1, A2 & B) demonstrated there was a significant increase in the average age of nurse participants from A1 hospitals (33.1 years) to A2 (36.4 years) and B hospitals (38.6 years). The type of nurse according to their current position in emergency was found to be different between the three hospital groups. Most nurses from A1 and A2 hospitals were RNs and nurses from B hospitals were predominantly ACNs. The average years of emergency experience of nurses at A2 hospitals (10 years) was greater than at B hospitals (9 years) or A1 hospitals (6 years). This same trend in experience differences was also seen with years of experience in triage and years of experience in current position. Nurses from A2 hospitals having more experience time in triage and their current position followed by B hospital nurses and A1 nurses.

There were no relationships found between the participants' characteristics (age, experience, etc.) and correct responses. The descriptive tables for each triage case scenario and the summary of case scenario by the mode of test delivery (computer vs paper) and population focus (adult vs paediatric) showed that participants were more likely to select the correct triage category when tested with the computer scenarios.

Regression analysis was the final method of analysis used to investigate whether the variables (age, gender, hospital group, and current nursing position and experience) were significant predictors in the correct selection of triage category. The literature does suggest these factors may influence triage decision-making thus the selection of these five variables for analysis. The results indicated the five covariants were not significant predictors of test performance with adult and paediatric scenarios (computer or paper).

4 Dual Triage

4.1 Dual triage methods

It may be argued that comparison of triage decisions made in the real triage environment gives a more accurate impression of triage decision-making. Comparison of triage nurse decisions made during real triage episodes may overcome some of the limitations of written scenarios and clinical simulation². To achieve this would involve two triage nurses independently triaging the same patient and comparison being made of their decisions. However there are inherent limitations in the logistics of allowing two nurses to triage the same patient.

4.1.1 Blinded dual triage

A blinded dual triage method would involve the patient being triaged independently by two triage nurses, with each triage nurse blinded as to the other's triage assessment. Research purists could argue that this is methodologically superior to other types of dual triage. However, there are a number of logistic issues to be considered with this method. The two triage nurses would require separate triage locations without visual or auditory contact and the triage environment would have to be safe and private for the patient. The ability to achieve these two logistic objectives in many EDs is almost impossible.

The use of blinded dual triage adds a further layer of process for the patient before emergency care can be initiated. The addition of a second triage episode to the patient's presentation to the ED can cause a delay, albeit a small one, in the initiation of emergency care. This raises ethical issues of causing the patient undue anxiety or stress. There is also the issue of patient safety. Whilst a delay of a few minutes may not produce an adverse outcome in patients allocated to lower triage categories, a delay of minutes would be detrimental to patients who present critically ill or injured. It is unlikely that this method could be used to evaluate triage decisions across all five triage categories given the ethical issues of including Category 1 and Category 2 patients in research of this nature.

Blinded dual triage methods are also unable to detect or isolate variations in the two-triage encounters. There is a high risk that the questions asked by the first triage nurse will prompt the patient to impart unsolicited information to the second triage nurse. Intervention by the first triage nurse, for example, the administration of first aid may also have influence on the triage decision of the second triage nurse. The patient's clinical status may also change between triage episodes therefore the two triage nurses may, correctly, arrive at different triage decisions.

4.1.2 Non-blinded dual triage

Dual triage without blinding is logistically more achievable than blinded dual triage however critics may argue that this method is less rigorous. Dual triage without blinding involves two triage nurses triaging the patient together during the one triage episode. Again there are issues of consistency of information elicited from the patient.

One option is to allow both triage nurses to interact with the patient. The use of this method has the inherent risk that one triage nurse may prompt the other by asking a particular question or measuring a parameter that the other triage nurse had not considered. The other variation of this method is to allow one triage nurse to interact with the patient whilst the other remains in a passive observational role. The advantage of this method is that both triage nurses can make a triage decision based on the same information, that is the information elicited from the patient by the active triage nurse. The disadvantage of this method is that the triage nurse in the passive observational role

is limited in the information available as he or she can not have the opportunity to elicit his or her own information from the patient.

4.2 Methodology

This project examined the degree of agreement between two triage nurses using the non-blinded dual triage approach, which is the same technique as used by Whitby, Ieraci, Johnson & Mohsin (1997) in their study². Two nurses (the ED Triage Nurse and a Project Triage Nurse) triaged the same patients. The Project Triage Nurse assumed a passive observational role and had no direct interaction with the patient. The method was chosen to prevent delay in the triage process, which might put patients at risk. The two nurses independently recorded the triage category and remained unaware (blinded) of the other nurse's response. The ED Triage Nurse was instructed on how to enter the triage category decision into a computer program that was designed to prevent the ED Triage Nurse or the Project Triage Nurse from knowing what categories their partner had entered. There was no direct correspondence on the correctness of the decision between the ED Triage Nurse and the Project Triage Nurse. The ED Triage Nurse and the Project Triage Nurse assessed a *minimum* of 15 patients in this manner during the shift.

4.3 Project Triage Nurse inter-rater reliability

The "Adult Discriminators for National Triage Scale Categories" was used to establish an acceptable level of inter-rater reliability among the Project Triage Nurses³. The discriminators are based on the findings of Whitby, Ieraci, Johnson & Mohsin (1997) and developmental work carried out by the ENA Triage Working Party². The discriminators were selected as they are succinct, being only a two-page document and they were largely based on objective physiological findings. The Project Coordinators were responsible for educating the Project Triage Nurses in the use of the physiological discriminators. The Project Triage Nurses had all been seconded from different EDs and it was necessary for the Project Coordinators to identify and eliminate organisational idiosyncrasies that were "normal triage practice" to the Project Triage Nurses. An acceptable level of agreement between the Project Triage Nurses was seen as fundamental to the rigour of the dual triage component of the study. The project team was aiming to achieve a level of agreement with a kappa value of 0.8 or greater.

A total of four shifts were spent at triage at Dandenong Hospital. During these shifts, and with the consent of the ED NUM and ED Triage Nurse, all three Project Triage Nurses observed every triage episode. The ED Triage Nurse at Dandenong was instructed to verbalise the results of patient assessment such as heart rate, pulse oximetry, and chest auscultation findings. The three Project Triage Nurses then recorded a triage category for that triage episode using a paper based data collection system. This process was blinded and each of the Project Triage Nurses was unaware of the other Project Triage Nurses decisions. No data was collected regarding the triage decisions of the ED triage Nurse at Dandenong Hospital.

The decisions made by the Project Triage Nurses were compared and the level of agreement evaluated using kappa statistics. At the end of each shift, the Project Coordinators evaluated the level of agreement and debriefed the Project Triage Nurses. The purpose of this was to discuss each triage episode where there was disagreement and, if necessary agree on modifications to the physiological discriminators. The number of triage episodes, level of agreement and kappa value for each of these shifts is seen in Table 4.1.

Table 4.1. Project triage nurse inter-rater reliability

Shift Date	Triage episodes	Level of agreement	Kappa
10.11.00	31	54.8%	0.58%
13.11.00	30	53.3%	0.57%
15.11.00	31	67.7%	0.70%
17.11.00	27	77.8%	0.74%
29.11.00	22	86.4%	0.85%
141			

4.4 Recruitment of participants

The recruitment process was previously discussed in Section 4.4. Once approval from Research and Ethics Committees was received from each site, all eligible ED Triage Nurses who agreed to participate in the dual triage component of project were grouped by hospital site and included in the sampling pool.

4.4.1 Sampling

Fourteen hospitals were requested to participate in the dual triage component of the project. The fourteen hospitals were chosen for their larger number of triage nurses and high patient throughput. This increased the chance of obtaining the targeted number of paired assessments within the project's timeframe. The sites participating in the dual triage component of the project were

Angliss Health Service	Maroondah Hospital
Austin Repatriation Medical Centre	Monash Medical Centre
Ballarat Health Service	Royal Melbourne Hospital
Barwon Health - Geelong Hospital	St Vincent's Hospital, Melbourne
Box Hill Hospital	The Alfred Hospital
Peninsula Health – Frankston Hospital	The Northern Hospital
Latrobe Regional Hospital	Western Hospital

The number of triage nurses employed at each site determined the sample size of triage nurses from each hospital. Each site was arbitrarily grouped according to the number of triage nurses employed and the number of nurses recruited from each site was defined for each hospital group. Table 4.2 defines the groups by the number of triage nurses employed and the sample size.

Table 4.2. Grouping of hospitals for triage nurse sample size

Hospital Group	Triage Nurses	Sample Size
Group 1	0-19	3
Group 2	20-30	4
Group 3	35 or more	5

Using this formula, the estimated sample size of ED Triage Nurses who would participate in completing the dual triage was fifty-five and it was anticipated that each dual triage pair would triage a minimum of 15 presentations, providing a minimum of 825 triage episodes for the study. Unfortunately, due to issues related to recruiting participants, the resulting sample size was forty-eight. Difficulties encountered included a smaller response rate than desired, staff resignations and leave. Table 4.3 displays the participant hospitals by group and the recruitment process for the triage nurses.

Table 4.3. *Participating hospitals and recruitment of triage nurses*

Hospital Group	Site	Letters distributed	Replies	Consent	Desired Sample Size	Participants
Group 1	Angliss Health Service	11	10	9	3	3
	Latrobe Regional Hospital	16	11	9	3	3
	Maroondah Hospital	18	13	13	3	3
	Western Hospital	13	13	10	3	3
Group 2	ARMC	32	10	6	4	4
	Ballarat Health Services	23	5	4	4	3
	Barwon Health - Geelong	27	16	16	4	4
	Box Hill Hospital	12	12	11	4	0*
	Frankston Hospital	20	16	16	4	4
	St Vincent's Hospital	30	12	10	4	4
	The Alfred Hospital	31	11	9	4	4
Group 3	Monash Medical Centre	45	31	27	5	4
	Royal Melbourne Hospital	30	8	7	5	4
	The Northern Hospital	30	12	8	5	5
Total	14	338	180	155	55	48

* Ethics approval not gained from Box Hill Hospital

Random sampling for ED Triage Nurses to participate in the “dual triage” was conducted in the same manner as for the “case scenario” component of the project (see Section 3.2.1, page 37).

4.4.2 Representativeness of the data

Figure 1 below suggests that the patient sample presenting to the participating emergency departments during the dual triage arm of the project were representative of the triaged population presenting during the period [October 1999 – March 2000].

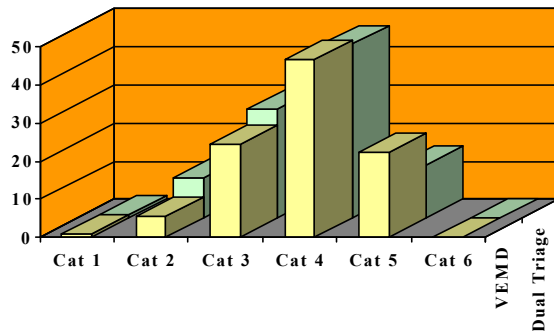


Figure 4.1 Frequency of triage categories by VEMD and Dual Triage

4.5 Data Collection

Prior to undertaking the dual triage component of the project, each participant was asked to complete a demographic profile as for the participants in the “case scenario” component of the project (see Section 3.3.)

The ED Triage Nurses consenting to participate in the dual triage component were paired with a Project Triage Nurse. In addition to the demographic data collected on the ED Triage Nurses, the following data was also collected during the dual triage:

Patient data:

Patient’s ED diagnosis (ICD-10)

Time (date) presentation

Triage categorisation (ED Triage Nurse)

Triage categorisation (Project Triage Nurse)

Department activity level (quiet, normal, busy)

Emergency department activity was measured using a scale based on the number of new patients allocated a triage category within a two-hour period. “Quiet” was defined as ≤ 5 patients, “Normal” as 6 to 10 patients, and “Busy” as >10 patients allocated a triage category⁴.

4.5.1 Methods used to analyze the data

4.5.1.1 i) Kappa Statistics

Kappa statistics were used to examine the inter-rater agreement between nurse pairs. Statistically two hundred paired responses provided enough of a sample to estimate kappa to within six percent of its true value. Error rates used in this analysis are $\alpha = 0.05$, $\beta = 0.80$.

The data was summarised using descriptive statistics (e.g., means, medians, modal values, and measures of dispersion). Measures of inter-rater reliability were derived using the kappa statistic, the agreement beyond that expected from chance (see Appendix 2).

4.5.1.2 ii) Regression Analysis

Regression analyses were performed to test for differences based on stratification of variables such as hospital, emergency presenting types and type of nurse training. The use of 800 paired cases provided sufficient power to achieve the intent of variance examination.

4.6 Results

4.6.1 Demographics of the participants

A total of 48 subjects participated in the dual triage arm of this study. Table 4.4 displays the demographics of the participants; values are presented as mean (standard deviation) for continuous variables and as frequencies (percentages) for categorical variables. One dual triage participant (from MMC) was excluded from the analysis due to incomplete data. The average age of the group was about 35 years and there were substantially more females than males (41 vs 7). Registered nurses, clinical nurse specialists and associate charge nurses represented about 90% of all participants. Subjects had spent an average of more than 7.5 years in the ED and more than 6.7 years in triage and about 75% of all subjects were from Group A1 or A2 hospitals. About half of the subjects were visited during what was classed to be a "normal" period of activity in the emergency department at the time.

4.6.1.1 Comparisons of the study population

The characteristics of male and female participants were compared. Male participants were more likely to be younger than females ([mean \pm SD] 29.33 \pm 2.73 vs 35.20 \pm 7.34; $p=0.002$). Females also had more experience in emergency department or triage settings, although these differences did not reach statistical significance. There were also no significant differences in terms of current position.

The characteristics of study participants were compared across hospital groups in Table 4.5. There were no statistically significant differences in terms of the sex, age, and current position of participants. Subjects had comparable experience in emergency department and triage settings, but participants from A2 hospitals spent almost three times as long in their current position as did nurses from A1 hospitals.

Table 4.4. Demographic characteristics of dual triage participants

Characteristics		Representation	
Number of subjects		48	100%
Average age		34.43 years	±7.18
Number of females		41	85.42%
Hospital group:	A1	20	41.67%
	A2	16	33.33%
	B	12	25.00%
ED activity:	Quiet	9	18.75%
	Normal	26	54.17%
	Busy	13	27.08%
Current position:	RN	2	4.17%
	CNS	29	60.42%
	ACN	14	29.17%
	NUM	3	6.25%
Average experience:	Emergency department	8 years	±6.99
	Triage	6.9 years	±5.27
	Time in current position	4.9 years	±4.20
General qualifications:	Hospital certificates	25	52.08%
	Undergraduate degrees	25	52.08%
	Postgraduate degrees	36	75.00%
Postgraduate qualifications	Graduate certificates		
	Emergency	12	25.00%
	ICU	3	6.25%
	CCU	1	2.08%
	Critical care	6	12.50%
	Other	1	2.08%
	Graduate diplomas		
	Emergency	11	22.92%
	Midwifery	2	4.17%
	Critical care	5	10.42%
	Occupational Health	1	2.08%
	Other	3	6.25%

Table 4.5. Hospital group-specific comparisons of the participants

Characteristics		Hospital A1		Hospital A2		Hospital B		p-value
Number of subjects		20		16		12		
Number of females		15	75.0%	14	87.5%	12	100%	0.163
Average age (years)		31.78	±5.82	35.07	±7.2	37.83	±8.0	0.064
Current position:	RN	1	5%	1	6.25%	0		0.561
	CNS	12	60%	8	50%	9	75%	
	ACN	5	25%	7	43.75%	2	16.67%	
	NUM	2	10%	0		1	8.33%	
Average experience: (months)	ED	85.89	±102.08	118.4	±69.06	86.00	±68.62	0.479
	Triage	69.60	±62.55	103.71	±59.09	76.00	±67.95	0.322
	Time in current position	36.00	±21.17	92.13	±64.49	54.92	±43.67	0.003

4.6.2 Triage agreement

Table 4.6 indicates the frequency of agreement between the ED Triage Nurse and the Project Triage Nurse, by hospital. The hospitals have been de-identified and are differentiated in the table by the allocation of a number. The frequency of agreement was highest at hospitals 2 (72.1%), 19 (67.1%), 12 (67%), 7 (65.9%) and 16 (64.3%). Patients were more often over triaged by the ED Triage nurse than under triaged.

Table 4.6. Frequency of agreement, under triage and over triage by hospital

Hospital	Agreement		Under triaged		Over triaged	
2	62	72.1%	7	8.1%	17	19.8%
3	49	60.5%	7	8.6%	25	30.9%
7	56	65.9%	4	4.7%	24	28.2%
9	32	58.2%	7	12.7%	16	29.1%
10	21	43.8%	1	2.1%	26	54.2%
12	61	67.0%	9	9.9%	21	23.1%
14	61	57.0%	13	12.1%	33	30.8%
16	45	64.3%	6	8.6%	19	27.1%
18	27	56.3%	3	6.3%	18	37.5%
19	47	67.1%	8	11.4%	15	21.4%
20	52	62.7%	2	2.4%	29	34.9%
23	27	40.3%	4	6.0%	36	53.7%
26	24	49%	11	22.4%	14	28.6%
TOTAL	564	60.0%	82	8.7%	293	31.2%

Of the 82 cases where under triaging took place, 76 (92.7%) cases were under triaged by the ED Triage Nurse within one category of the Project Triage Nurse and six (7.3%) cases were under triaged within two categories. Of the 293 cases where over triaging took place, 279 (95.2%) cases were over triaged by the ED Triage nurse within one category of the Project Triage Nurse and twelve (4.1%) cases were over triaged within two categories and two (0.7%) were over triaged within three categories.

Table 4.7 displays the under triaged cases and Table 4.8 displays the over triaged cases by hospital site.

Table 4.7. Under triaged patients by category and hospital site.

Hospital Code	Category 2		Category 3		Category 4		Category 5		Total
	By 1 Cat	By 2 Cat	By 1 Cat.	By 2 Cat	By 1 Cat	By 2 Cat.	By 1 Cat	By 2 Cat	
2	1		3	1	2				7
3	3		4						7
7	*		2		2				4
9	1		6						7
10	*		1						1
12	1		4	1	3				9
14	3	1	9						13
16	2		3		1				6
18	*		1	2					3
19	4		4						8
20	1		1						2
23	1		3						4
26	6		4	1					11
TOTAL	23	1	45	5	8	0	0	0	82

Table 4.8. Over triaged patients by category and hospital site.

Hospital Code	Category 2		Category 3		Category 4		Category 5			Total
	By 1 Cat	By 2 Cat	By 1 Cat	By 2 Cat	By 1 Cat	By 2 Cat	By 1 Cat	By 2 Cat	By 3 Cat	
2					4		12	1		17
3	1		1		6		17			25
7			2		8		12	2		24
9			1	4			11			16
10			7		9		10			26
12					11		10			21
14			1		9	1	22			33
16	1		1		8		9			19
18			1		4	1	12			18
19					1		14			15
20			3		6		20			29
23			11	1	8	1	12	1	2	36
26			1		1		12			14
TOTAL	2	0	29	5	75	3	173	4	2	293

4.6.3 Agreement and kappa

Agreement was assessed using measures of simple agreement and kappa, a measure of agreement that takes chance into account. The forty-eight participants contributed a total of 940 triage episodes. Observed agreement ranged from a minimum of 27.78% to a maximum of 86.96% with a mean \pm SD of 60% \pm 13.61%. The mean \pm SD kappa value was 43.18% \pm 19.03%. A large spread of results was observed; kappa ranged from 0 to more than 82.49%. Table 4.9 displays these results.

Table 4.9. Descriptive characteristics of agreement.

Characteristic	Mean	Standard Deviation	Minimum	Median	Maximum
Observed agreement	60.00%	13.61%	27.78%	60.00%	86.96%
Expected agreement	29.73%	5.82%	17.99%	29.61%	46.91%
Kappa	43.18%	19.03%	0.00%	42.31%	82.49%

Table 4.10 displays the results of the pairwise correlations. Kappa was found to be negatively correlated with age and experience, although none reached statistical significance.

Table 4.10. Pairwise correlations between kappa and continuous covariates.

	Pearson's r	p-value
Age, years	-0.1709	0.256
ED experience, months	-0.0477	0.752
Triage experience, months	-0.1822	0.254
Time in current position, months	-0.2402	0.108

Table 4.11 displays correlation between the participants' characteristics and kappa. There was a strong association between kappa and sex. Males had a chance-adjusted agreement of almost twice that of females (63.44% vs 38.41%; $p < 0.001$). Those with undergraduate nursing degrees also exhibited a higher kappa score (49.18% vs 36.20%; $p = 0.017$). Although there was some indication that kappa trended upward with ED activity, there were no statistically significant differences observed between this or other variables.

Table 4.11. Estimates of kappa based on levels of categorical variables.

Characteristics		Kappa (%)	p-value
Sex	Male	63.44	<0.001
	Female	38.41	
Hospital group	A1	49.00	0.137
	A2	39.74	
	B	36.30	
ED activity	Quiet	40.08	0.710
	Normal	42.26	
	Busy	46.55	
Current position	RN	53.87	0.671
	CNS	40.55	
	ACN	45.31	
	NUM	47.86	
General qualifications	Hospital certificates		
	Yes	38.11	0.060
	No	48.42	
	Undergraduate degrees		
	Yes	49.18	0.017
	No	36.20	
	Postgraduate degrees		
	Yes	43.75	0.718
No	41.40		

4.6.4 Regression analyses

The results of the multiple regression analyses on various sets of covariates (after adjustment for observer effects) are provided in Table 4.12. Results are given as regression coefficients and standard errors, except for those referring to model characteristics.

Instead of applying an automatic stepwise approach to adjustment, covariates were successively entered into increasingly specified models. The initial model (Model 1) adjusted for nurse sociodemographic variables (age and sex). This model, accounting for about forty percent of the variability in estimates, suggests that differences in agreement according to gender persist in spite of adjustment for age. Model 2 adjusts for specific environmental variables (hospital group and ED activity) over those covariates in Model 1. The persistence of the independent effect of sex is still evident, with no other covariate attaining statistical significance.

Model 3 represents the fully specified model adjusting for current position and experience plus those covariates previously considered. This model accounts for

approximately 58% of the variance in the study population. A few important relationships emerge:

Age is inversely related to agreement, although not in a statistically significant manner. In this population, every year of age is associated with a decrease in agreement of about one-percent after adjustment for all other variables.

Females show approximately a 25% decrease in agreement compared to males after adjustment for all other variables.

The level of agreement of nurses in Group B or Group A2 was comparable to those in Group A1 hospitals.

Subjects in “busy” emergency departments were found to have agreement that was not statistically significantly higher when compared to those working during “quiet” or “normal” activity levels after adjustment for all other variables. The positively associated trend in increasing agreement with increasing ED activity was likewise not statistically significant.

There were no statistically significant relationships between agreement and either of current position or experience.

Table 4.12. Multivariable regression of kappa (%)

Characteristics		Model 1	Model 2	Model 3
R ² , %		40.01	42.87	47.38
Constant		54.59 (12.16)***	49.50 (13.59)***	88.96 (25.88)**
Age (per year)		0.06 (3.44)	0.11 (0.41)	-0.97 (0.79)
Female (versus male)		-24.52 (6.57)***	-26.99 (7.09)***	-26.62 (8.87)**
Hospital group (versus A1)	A2		1.81 (6.79)	9.53 (8.32)
	B		1.74 (8.84)	7.34 (11.01)
ED activity (versus “quiet”)	Normal		2.28 (8.04)	7.33 (9.61)
	Busy		9.13 (8.53)	17.48 (11.62)
Current position (versus “RN”)	CNS			-14.66 (15.81)
	ACN			-19.56 (14.32)
Experience (per month)	ED experience			0.11 (0.07)
	Triage experience			-0.03 (0.13)
	Time in current position			-0.06 (0.13)

* p≤0.05, ** p≤0.01, *** p≤0.001

4.7 Limitation of the study design

There are a number of limitations to the design. A major limitation was the inability to truly blind the two nurses during the triage process. However, the nature of the environment and the influences on the patient after contact with one nurse makes blinding virtually impossible. Thus, confounding variables such as the Project Triage Nurse missing important cues of the patient’s condition may have influenced categorisation of patients. One of the strategies used to reduce some of this was instructing the ED Triage Nurse to verbalise cues such as pulse rate, tactile sensations such as cold, warmth, clammy skin during the triage assessment process.

The project team were aware of the potential for the presence of the Project Triage Nurse to affect the behaviour of the ED Triage Nurse (“Hawthorne effect”) and strategies were employed to minimise this occurrence. The Project Triage Nurse used predetermined instructions with the ED Triage Nurse to explain the role of the Project Triage Nurse and data collection requirements. This ensured that the information given to each ED Triage Nurse was consistent. The Project Triage Nurse sat or stood behind the ED Triage Nurse and did not interact in any way with the ED Triage Nurse or the patient. The Project Triage Nurse did not comment on or discuss triage episodes with the ED Triage Nurse.

The methodology used in this project relied heavily on the cooperation of ED NUMs and ED Triage Nurses. This raises the potential limitation of poor response rates from some sites. Whilst the project team endeavoured to engage the support of ED NUMs and ED Triage Nurses there was really no way of ensuring the participation of the majority of triage nurses at participating EDs.

4.8 Conclusion

The participants’ average age was 35 years and there were substantially more females than males (41 vs 7). Male participants were more likely to be younger than females. The trend was for females to have more experience in emergency department or triage settings, although these differences did not reach statistical significance. There were also no significant differences in terms of current position.

The characteristics of study participants were compared across hospital groups A1, A2 and B. There were no statistically significant differences in terms of the sex, age, and current position of participants between the hospital groups. Participants had comparable experience in emergency department and triage settings, but participants from A2 hospitals spent almost three times as long in their current position as did nurses from A1 hospitals.

The descriptive data indicated that the overall triage agreement was found to be 60%. Patients were more often over triaged (31.2%) by the ED Triage nurse than under triaged (8.7%).

Correlations between the participants’ characteristics and kappa showed a strong association between kappa and gender. This suggests the males were more likely to have triage agreement with the project triage nurse. Those with undergraduate nursing degrees also exhibited a higher kappa score suggestive they would have a slightly higher incidence of agreement. Although there was some indication that kappa trended upward with ED activity, there were no statistically significant differences observed between this and other variables. Suggestive that in some cases there was better triage agreement during busy periods in the department.

According to the regression analysis gender appeared to be a predictor of agreement with females showing a decreased incidence of triage agreement compared to their male counterparts. Otherwise there were no other variables identified as significant predictors of agreement.

5 Summary

In summary, the case scenario arm of the study identified there were some nurse characteristic differences found between the three hospital groups (A1, A2 & B). For instance, nurses from *Hospital Groups A2 & B* tended to be older, have more work experience time in emergency and triage, and have more senior positions (*Hospital Group B*) within the departments.

Overall the test performance of the nurses was found to be better with the computer-based scenarios versus the paper-based scenarios in both population focus groups (adult and paediatric). However, it is unknown why test performance was improved with computer scenarios and this requires further exploration.

In the dual triage arm of the project there were no nurse characteristic differences found across the three hospital groups. There were some differences found between males and females in the sample. Males tended to be younger and have less work experience. Males were also more likely to demonstrate triage agreement with the project triage nurse.

The use of both simulated triage (case scenario) and real time triage (dual triage) allowed the team to examine in a multi-modal way the test performance / agreement of triage nurses. The computer based scenarios demonstrated the highest test performance (Paediatric 67.8%) (Adult 64.6%) followed by the dual triage agreement (60%) and paper based scenarios (Adult 56.5%) (Paediatric 54.1%). These results indicated that any of the three methods or a combination of the methods would be useful from an educational perspective or as a method of assessment and monitoring triage consistency in departments. The advantage of offering different options provides each department the opportunity to tailor education and quality assessment to needs.

Across both arms of the project (scenario and dual triage) the factors examined (nurse characteristics, hospital group, and experience) were *not* found to be predictive of better or worse test performance or agreement according to the regression analyses. These results were the same for delivery (computer and paper), dual triage, and population focus (adult or paediatric). This indicated there were no specific factor(s) that stood out, as having an effect on consistency that required targeting for education. The only exception to this was found in the dual triage arm where females demonstrated a decreased likelihood of agreement compared to their male counterparts. There was also a trend for older individuals to demonstrate less agreement however this was not significant. Thus, the results suggest that although some characteristics varied across the hospital groups they did not have a significant effect on test performance / agreement.

However, other factors not examined in this project may account for some of the variability in test performance or agreement. For example some departments use guideline / protocols to assist the triage decision making process. Another possibility is situational factors that occur within departments (such as an aggressive/abusive patient; frail aged patient; vocal and highly agitated child) where the triage nurse may over triage the patient to ensure they are seen in less time. These factors and a number of other cofounders, not accounted for in the project, could affect the findings.

Assessment of the "Adult Discriminators for National Triage Scale Categories" during the dual triage arm of the project, as used by the Project Triage Nurses, identified a high and acceptable level of inter-rater reliability (kappa 0.85%). The discriminators used were based on the results of a previous study and the developmental work carried out by the ENA Triage Working Party². The use of the discriminators ensured the triage decisions were based largely on objective physiological findings. Following the review of the literature and consultation with key personnel (ENA Triage Working Party, Consistency of Triage in Emergency Departments Project Steering Committee), the use of physiological discriminators was deemed to be the most objective and clinically acceptable basis for triage education. It was also identified that further input from emergency triage nurses would assist in the expansion of the Adult Discriminators to include paediatric presentations and the need for psychological discriminators.

The results obtained from the consistency of triage arms of the project and the ED survey assisted the team in the development of the “*Guidelines for Triage Education and Practice*” and the Triage Audit tools. (see ‘*Education and Quality Report*’).

The results of this stage of the project helped to establish that no sub-group(s) of individuals, departments or hospital groups required specific targeting. It appeared that the development of an educational package and quality assessment tool would be more beneficial if it were generic and flexible to meet the needs of different emergency environments.

It was recognised that the audit tools should complement the education package such that the two resources could be used in tandem. The team foresaw the tool as a quality resource must extend beyond just a method of evaluating implementation of the triage education package but also have use as a tool to monitor consistency as a part of best practice.

References

1. Jelinek G, Little M. Inter-rater reliability of the National Triage Scale over 11,500 simulated occasions of triage. *Emergency Medicine* 1996;**8**(226-230).
2. Whitby S, Ieraci S, Johnson D, Mohsin M. Analysis of the process of triage: the use and outcome of the National Triage Scale. Liverpool: Liverpool Health Service, 1997.
3. Emergency Nurses' Association of Victoria (Inc). Position Statement: Educational preparation of triage nurses. 2000b.
4. Hollis G, Sprivulis P. Reliability of the National Triage Scale with changes in emergency department activity level. *Emergency Medicine* 1996;**8**:231-234.

Appendix 1 Recruitment Letter

Letter of Invitation to Participate

20th October, 2000

Dear Triage Nurse Colleague

We would like to invite you to participate in the 'Consistency of Triage in Emergency Departments' project. This six-month project is a Department of Human Services (DHS) initiative focusing on the consistency of triage in Emergency Departments across Victoria. A team from the Monash Institute of Public Health will undertake this six-month project and a steering committee with representation from DHS, ACEM, ENA, and medical and nursing staff from a variety of Victorian Emergency Departments will oversee the project.

This is an exciting project that will influence contemporary triage practice in Victoria. The project team recognizes that consultation with ENA, and emergency nurses from clinical, educational and managerial roles is fundamental both to the success of this project and in ensuring that emergency nurses determine the future direction of triage education and practice. This project will also provide Victorian triage nurses with educational resources and quality assurance strategies that will be developed by nurses, for nurses.

The long-term objective of the project is to improve the consistency of application of the NTS across Victorian emergency departments. The first stage of the project is to get a state wide profile of the consistency of triage and is dependent on the participation of triage nurses across Victoria. The data collected in this stage will be used to inform triage education and quality assurance strategies. The data collection component of this stage involves members of the project team visiting 28 Emergency Departments across Victoria. As the project team is mindful of the workload issues facing Emergency Departments at the current time, we would like to identify those triage nurses who are happy to be approached to participate. All information collected in the course of this project will be confidential and will be presented in aggregate form so as no individual triage nurse or individual Emergency Department will be identifiable.

There will be two approaches used to collect data in this stage of the project. The first approach will involve the completion of a series of triage scenarios and the second approach will involve observation of actual triage episodes.

Scenario Completion

Approval from both the Nurse Unit Manager and Medical Director of your Emergency Department will be sought before this can occur as well as your consent. We will be randomly selecting 5 - 10 triage nurses from each participating Emergency Departments to complete the scenarios. These scenarios will be both in a paper based format and computer format and it is anticipated that this will take approximately 15 - 30 minutes of your time to complete. The data collected will be anonymous but the project team will ask you for some demographic information such as age, qualifications and years of nursing and triage experience. Agreement to be approached to participate in the written scenarios means that you may or may not be selected. If you are selected to participate in

completing the scenarios, a member of the project team will telephone you and confirm that you consent to participate and negotiate a time that is suitable to come to your Emergency Department.

Triage Observation

Approval from both the Nurse Unit Manager and Medical Director of your Emergency Department and from your hospital's Research and Ethics Committee will be sought before this can occur. We will be selecting 3 - 5 triage nurses from each participating Emergency Department to participate in the triage observation. During this data collection process a member of the project team, who has expertise in triage, will come to your Emergency Department and sit with you at triage. Their role is a passive one and they will not interact with your patients. Again, the data collected will be anonymous but the project team will ask you for some demographic information such as age, qualifications and years of experience. The only information that will be collected from you will be the triage category that you assign to the patient. You will be asked to enter the triage category into a laptop computer. The Project triage nurse with you will not see what you have entered. The Project triage nurse will enter their triage category into the computer, which you will not see. There will be no discussion concerning the triage decisions that have been made by either yourself or the Project triage nurse.

Agreement to be approached to participate in the triage observation means that you may or may not be selected. If you are selected to participate in the triage observation, a member of the project team will telephone you and confirm that you consent to participate and negotiate a time that is suitable to come to your Emergency Department.

Your Emergency Department has been selected to participate in both the scenario completion and the triage observation.

We would like to invite you to participate in this exciting project and would be very grateful of your support given the enormity of the project and the very short time frames. This is a fabulous opportunity for Victoria to lead the way in triage practice and we sincerely hope that you will be willing to be involved. Please find enclosed an expression of interest form - we would be very grateful if you could respond to this form, either in writing, by telephone or by e-mail by [Date]

Yours sincerely

Amanda Charles and Julie Considine

Project Coordinators

Expression of interest - 'Consistency of Triage in Emergency Departments' project

Surname _____

First name _____

Emergency Department _____

I am happy to be approached to participate in *both* the scenario completion and triage observation

I am happy to be approached to participate in *only the scenario completion*

I am happy to be approached to participate in *only the triage observation*

Telephone (work) _____

E-mail: _____

Days per week _____

Rotating roster Permanent ND

I *do not* wish to be approached to participate in either the scenario completion or the triage observation

Please find the contact details for the Project Coordinators below.

We would be very grateful for your response to this letter by Friday 11th November. If you would like to respond in writing please complete this form and return it to your Nurse Unit Manager. If it is easier for you to respond by telephone or e-mail this is fine. Please ensure that you leave your surname, first name, the ED in which you work the areas in which you are willing to participate and whether you work a rotating or permanent night duty roster.

Only the Project Manager and Coordinators will have access to this information. All information given will be confidential and will be destroyed at the completion of the project. If you wish to discuss any aspect of this project, please feel free to contact either of the Project Coordinators.

Amanda Charles

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Appendix 2 Measures of Inter-rater Reliability

Measures of inter-rater reliability were derived using the kappa statistic, the agreement beyond that expected from chance where, given a table:

$$k = \frac{p_O - p_E}{1 - p_E}$$

$$p_O = \sum_{i=1}^k p_{ii}$$

$$p_E = \sum_{i=1}^k p_{i.} p_{.i}$$

Rater A	Rater B				Total
	1	2	...	k	
1	p_{11}	p_{12}	...	p_{1k}	$p_{1.}$
2	p_{21}	p_{22}	...	p_{2k}	$p_{2.}$
...					
k	p_{k1}	p_{k2}	...	p_{kk}	$p_{k.}$
Total	$p_{.1}$	$p_{.2}$...	$p_{.k}$	1

A 95% confidence interval around kappa is provided by the formula:

$$95\% \text{ CI} = k \pm 1.96 \left(\frac{\sqrt{p_E + p_E^2 - \sum_{i=1}^k p_{i.} p_{.i} (p_{i.} + p_{.i})}}{(1 - p_E) \sqrt{n}} \right)$$