REPORT

2016 – 2018

NATIONAL TRAUMA RESEARCH INSTITUTE

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FOREWORD

It is almost four years since I took over as Director of the National Trauma Research Institute (NTRI), from my predecessor Professor Russell Gruen. Whilst the NTRI remains dedicated to improving care of the injured much has changed and evolved.

I took over the NTRI in March 2015, at a time that marked the final few months of some very large research programs. The Centre of Excellence in Traumatic Brain Injury Research and NTRI Forums programs, funded by the TAC, were close to completion. The Neurotrauma Evidence Translation program (NET), a five-year program to increase the uptake of research evidence in the clinical care of patients who have sustained traumatic brain injury, was in its final year, along with the Evidence Service. In addition, there were several large projects in their early stages, such as the Australia-India Trauma Systems Collaboration (AITSC), a four year program to find the best ways of delivering required care to injured people in Australia and India, and a randomised controlled trial of a trauma awareness program in naval trainees.

In my first year as Director there was a need to integrate some of the large trauma systems development projects being undertaken by the Alfred Trauma Service into the NTRI, and to build a fully functional collaborative team from the trauma service and NTRI staff. One immediate project was to resurrect the Australian Trauma Registry, which has ceased operating in 2014.

The year 2015 was a year of movement, changes and adaption, however it set the groundwork for what was to come. Over the last few years we have built a strong working team of clinical and non-clinical researchers and administrators, that are working together across our five main themes.

This report presents the activities and outputs of the National Trauma Research Institute over the last three years, which now includes a robust international trauma systems development department, a number of trauma education courses and registries, along with the development of trauma biotechnologies.

Director
Professor Mark Fitzgerald (ASM)
MBBS | MD | FACEM | AFRACMA

MISSION

improving care of the injured

The National Trauma Research Institute's mission and goals are focused on reducing death and disability and improving the quality of life of survivors of traumatic injury.

It collaborates with organisations nationally and internationally to integrate research, education, medical technologies and trauma systems development to improve clinical care and outcomes.

WHO WE ARE

The National Trauma Research Institute (NTRI) Melbourne was established in 2003 as a partnership between Alfred Health and Monash University. The NTRI Melbourne is located within the Alfred Medical Research and Education Precinct (AMREP) at The Alfred campus in Melbourne. The NTRI also has an office in Queensland located at the Gold Coast University Hospital, and collaborates with member organisations such as the Royal Children's Hospital (Melbourne) and Ambulance Victoria.

Our research themes cover the spectrum of trauma clinical care. We have special programs in traumatic brain injury; computerised decision support; pleural decompression; systems development and monitoring; trauma quality improvement (including trauma registry development); the development of trauma technologies; and the development and measuring of trauma prevention and education.

MANAGED OVER

$60 MILLION (AUD)

RESEARCH & DEVELOPMENT FUNDS

800+ PUBLICATIONS

10,000 + TOTAL CITATIONS

STRATEGIC OBJECTIVES & ACTIONS

OBJECTIVE 1: TRANSFORMATIVE RESEARCH

The NTRI will lead and conduct innovative high quality trauma research that will enable more effective treatments, higher quality care and better trauma systems.

1.1	Develop and support research programs that bring together research leaders, clinicians and other stakeholders to conceive and undertake innovative projects.
1.2	Ensure all our systems development and education projects are evidence based and have research and evaluation components.
1.3	Maintain and strengthen engagement with Alfred and Monash-based clinicians, and other national and international researchers and clinicians by leading, coordinating or supporting multicentre projects.
1.4	Lead the way in the development of trauma care biotechnologies.
1.5	Attract competitive and contract research grants to sustain and increase our research activity.

OBJECTIVE 2: HEALTH IMPACT

The NTRI will ensure that it has demonstrated impacts on clinical trauma care, trauma education, and healthcare policy to improve care of the injured.

2.1	Engage clinician researchers through joint appointments with The Alfred and other hospitals.
2.2	Work with The Alfred, Alfred precinct partners, national and international trauma centres to develop and implement evidence based trauma care, and evidence based trauma care education.
2.3	Engage with governments and other agencies to inform trauma care policy, programs, and the development of trauma systems and to promote a coordinated approach to injury prevention and control.
2.4	Provide a forum for government officials, business and professional leaders, clinicians, scientists, community members, the media and other stakeholders to come together to address major trauma related challenges.
2.5	Partner across health care systems to improve care of the injured.

OBJECTIVE 3: QUALITY

The NTRI will use the best available evidence to inform the delivery of high-quality trauma care and the development of effective and efficient trauma systems.

3.1	Use current research to understand why gaps exist between best practice care and current practice, and tailor interventions to address these gaps.
3.2	Develop and use dedicated in-hospital trauma registry data to support trauma care, measure trauma quality and tailor trauma quality improvement initiatives.
3.3	Trial targeted and tailored trauma quality improvement initiatives locally, nationally and internationally.
3.4	Continue to support and maintain the Australian Trauma Registry under the Australian Trauma Quality Improvement Program, and share this model with international collaborators.

OBJECTIVE 4: SUSTAINABILITY

Ensure that the NTRI has the financial and human resources to continue to develop into the future.

4.1	Increase research income through competitive grants, philanthropy, and industry and commercial activities.
4.2	Increase our international contract research and development collaborations with our nearest geographical neighbours.
4.3	Enhance our relationships with national and international government agencies and institutions, to leverage funding from multiple sources.
4.4	Increase our income from the sale and/or license of NTRI developed trauma technologies.
4.5	Develop a wide program of fee for service trauma care education courses and university postgraduate degrees and certificates.

CONTENTS

RESEARCH

MEASURING THE EFFECTIVENESS OF P.A.R.T.Y PROGRAMS IN REDUCING ALCOHOL-RELATED HARMS IN YOUNG NAVAL TRAINEES

LEAD INVESTIGATOR: Jeffrey Rosenfeld

COLLABORATORS: NTRI, the Alfred, Monash University, HMAS Cerberus

FUNDING: Defence Health Foundation

PROJECT DURATION: 2014 to 2018

PHD STUDENT: Jason Watterson

SUPERVISORS: Professor Belinda Gabbe, Professor Mark Fitzgerald

The National Trauma Research Institute (NTRI) has delivered the Prevent Alcohol & Risk-related Trauma in Youth program or P.A.R.T.Y at The Alfred in Melbourne since 2009. P.A.R.T.Y is a trauma prevention and health promotion initiative that seeks to build resilience in participants through the lived experience of a major trauma service, aiming to effect a change in the perception that traumatic injury will not happen to them.

The NTRI's Royal Australian Navy (RAN) P.A.R.T.Y program for naval trainees has been operating at The Alfred since 2011. A retrospective pilot evaluation conducted in 2013/14 suggested a benefit in those "at-risk" trainees who attended the in-hospital P.A.R.T.Y program

A 3-arm randomised controlled trial (RCT) that focused on new Navy trainees was conducted. Participants were randomly allocated to attend RAN P.A.R.T.Y (either at the hospital program or an adapted on-base at CERBERUS) or to not participate in P.A.R.T.Y at all. All participants completed the validated, World Health Organization's Alcohol Use Disorders Identification Test (AUDIT), a screening tool for alcohol-related behavior (already used by the RAN) prior to randomisation, and 12 months post randomisation.

In addition, a selection of other tools and their 12-month incident data collected. The RCT protocol was published in 2017 (Watterson, J, et al. 2017). Measuring the effectiveness of in-hospital and on-base Prevent Alcohol and Risk-related Trauma in Youth (P.A.R.T.Y.) programs on reducing alcohol related harms in naval trainees: P.A.R.T.Y. Defence study protocol. BMC Public Health, 17(1), 380).

At the completion of recruitment in May 2016, 952 trainees had consented to participate in the research. Ten in-hospital and nine on-base programs were conducted across the program period. The overall attendance of participants was 81.5%. Twelve-month follow up questionnaires have now been received from 81% of participants recruited into the study, and 12-month incident data has been collected for 100% of participants. The data is currently being analysed.

The final results of this study will be published in 2019. The P.A.R.T.Y. Defence Program continues to be run in-hospital and on-base supported by HMAS Cerberus.

TOWARDS BETTER DETECTION AND MANAGEMENT OF SPORTS CONCUSSION

LEAD INVESTIGATORS:	Biswadev Mitra, Catherine Willmott, Jeffrey Rosenfeld, Andrew McIntosh, Michael Makdissi and Peter Cameron
COLLABORATORS:	NTRI, The Alfred, Monash Institute of Cognitive and Clinical Neurosciences, Monash University, Australian Football League (AFL)
FUNDING:	NHMRC, AFL and NTRI
PROJECT DURATION:	Commenced: January 2017 | Expective Completion: May 2019
PHD STUDENT:	Jonathan Reyes
SUPERVISORS:	Catherine Wilmott, Andrew McIntosh, and Biswadev Mitra

The game of Australian Football is a contact sport that involves high flying marks and high impact tackles, and where head impacts are common. In Victoria, Australia, between 2003 and 2011 there were 4745 hospitalisations for sport-related concussion and this number is increasing. Under-diagnosis and under-reporting, in junior and amateur competitions, is common and the above numbers likely represent a `fraction of the true incidence of sports associated concussions, especially in junior and non-elite competition.

At present, the identification of players at risk of concussion in the elite and semi-elite leagues (AFL and VFL) is largely based on detection of signs by medical or support staff during game, and/or review of video footage post-game. In amateur and junior games the process is of identifying at-risk players is variable, and trained medical and support staff are rarely present. Any adverse effects of head injury are reliant on self-reports by players or observation by support staff.

X2Biosystems (USA), developed the X-Patch, an impact sensing device that could be worn without a helmet, that when combined with concussion monitoring software claims to provide an objective measure of a head impact. The X-Patch, worn behind the athlete's ear, measures linear accelerations and rotational/angular accelerations. These accelerations are uploaded into a software system that transforms the data into impact data. The data can be assessed and applied to player management as well as being stored for longer-term player management and research.

In 2015 the investigator team was awarded Monash Strategic Grant Scheme funding to investigate the X-PATCH and software system. A small pilot trial in a two men's and two women's senior amateur teams found that the devices had the capacity to detect linear impacts observed in the field, although rotational data was less accurate. This trial led to a successful NHMRC Partnership grant application in 2016.

The purpose of the NHMRC Partnership was to explore the potential of the X-Patch to measure accelerations of the head and assist in screening players for concussion. In 2017, AFL and AFLW players in the JLT Community Series and inaugural AFL Women's Competition, wore the X-Patch during one game. In addition, the X-Patch was also worn during a full season of a senior amateur male and a senior amateur women's competition, combined with neurocognitive assessments. This study is the first in vivo study of the biomechanical forces associated with head impact in Australian football.

If effective in Australian football, accelerometers such as the X-Patch could provide a large amount of objective information, previously unattainable, about the forces experienced by players over the course of a game, or a season. Ultimately this device could assist in the management of head injury in players, particularly elite players at risk of accumulated damage, and amateur or junior players where support is variable. The results of these studies will be available in 2019.

PADDED HEADGEAR USE IN YOUTH FOOTBALL: WHAT IS THE EVIDENCE?

LEAD INVESTIGATORS:	Catherine Willmott, Biswadev Mitra, Andrew McIntosh, Jeffrey Rosenfeld, Michael Makdissi, Teresa Howard, Patrick Clifton, and Peter Harcourt
COLLABORATORS:	NTRI, The Alfred, Monash Institute of Cognitive and Clinical Neurosciences, Monash University, Australian Football League (AFL)
FUNDING:	Walter Cottman Charitable Trust, and the AFL
PROJECT DURATION:	September 2017 to 2020
PHD STUDENT:	Jennifer Makovec-Knight

To date, very little research has investigated the use of padded headgear to reduce the risk of concussion and sub-concussive head impacts in Australian football. The research program will evaluate the use of headgear at all levels of junior Australian football across players, parents and club officials; compare baseline head and orofacial injury rates across junior clubs which do or do not currently mandate headgear; and investigate the relationship between player attitudes towards headgear and on field behaviour.

The study will address the complex issue of the use of headgear for the prevention of sports concussion in junior Australian football. Here, “headgear” refers to soft shell-less padded helmets. Whilst there is substantial evidence to support the use of hard helmets to decrease the risk of catastrophic brain injuries in some international sporting codes, whether headgear protects athletes from sports concussion is largely unproven.

The study has three components. Firstly stakeholder consultation at all levels of junior and youth football, including male and female players, parents, coaches and club administrators to determine attitudes towards the use of headgear and current decision making processes. Secondly, the research will also undertake injury surveillance in order to establish baseline injury rates, which are currently not available, for those wearing and not wearing headgear. Lastly we will conduct a pilot prospective cohort study using headgear and impact sensing technology,the project will investigate correlations between player use of headgear, game-play behaviour, and will compare the impacts sustained with and without headgear.

AUSTRALIA-INDIA TRAUMA SYSTEMS COLLABORATION

LEAD INVESTIGATORS: Mark Fitzgerald (Australia) and Mahesh Misra (India)*

COLLABORATORS: NTRI, The Alfred, Monash University, The George Institute for Global Health, Ambulance Victoria, Australian Centre for Health Innovation, World Health Organisation, JPN Apex Trauma Center All India Institute of Medical Sciences (AIIMS), Delhi Centralised Accident and Trauma Service (CATS), Guru Teg Bahadur (GTB) Hospital & University College of Medical Sciences, Lokmanya Tilak Municipal (LTM) General Hospital & Medical College, GVK-Emergency Management and Research Institute (EMRI) – Ahmedabad, Sheth Vadilal Sarabhai General Hospital (VS) & N.H.L. Medical College, BVG-MEMS - Maharashtra Emergency Medical Services, Mumbai, International Association for Trauma Surgery and Intensive Care (IATSIC) & University of Washington, Rajiv Gandhi Government General Hospital, Madras Medical College.

FUNDING: Australia India Strategic Research Fund (AISRF) Grand Challenge Scheme, a joint initiative between the Australian Government (Department of Industry, Innovation, and Science) and the Indian Government (Department of Science and Technology).

PROJECT DURATION: 2013 to 2018

In India the contribution of injuries to the total disease burden has increased in all states since 1990. Road traffic crashes constitute a little over 50% of all injuries in India, the rest due to falls, railway incidents, intentional and unintentional harm. In 2016 there were 480,652 road traffic crashes in India claiming 150,785 lives and leaving another 494,464 persons injured, with a crash severity of 31.4 persons killed per 100 crashes. These figures translate to 55 road crashes and 17 deaths per hour.

In Australia, injury is a National Health Priority Area, second only to cardiovascular disease for hospital-related expenditure, and costs over $18 billion per year in direct and societal costs. More than 600,000 Australians report having a disability caused by injury. Because it is the major cause of death in children and adults up to 50 years old, and for every death 30 are severely injured and 10 permanently disabled, injury is a major cause of lost productivity in both countries.

The Australia-India Trauma Systems Collaboration (AITSC) brings together governments, industry, clinicians and researchers to improve information and resources, and to pilot new systems of care.

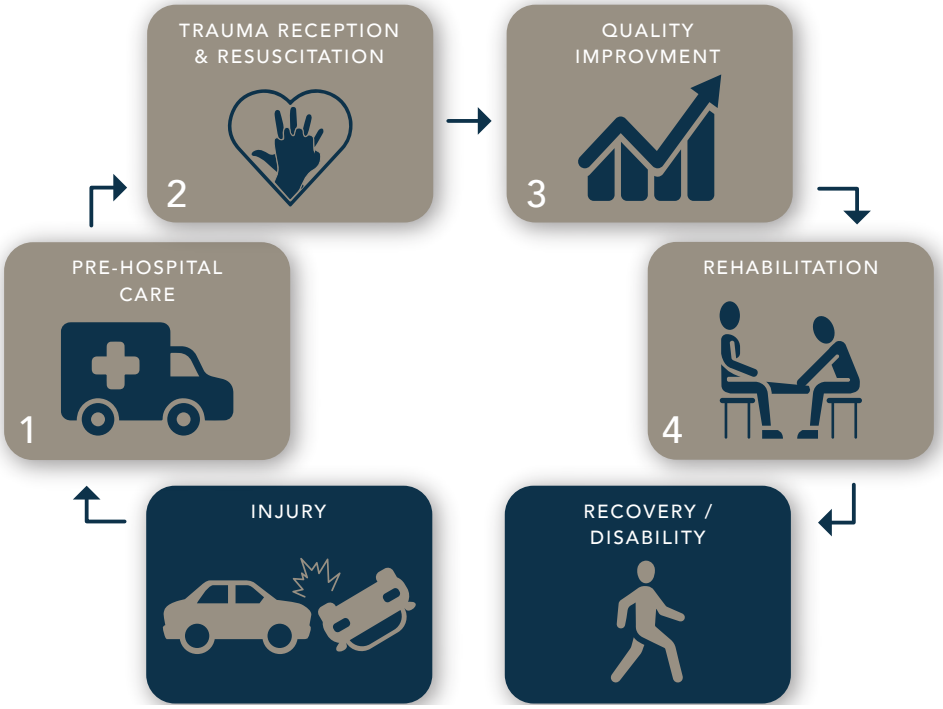
These projects were designed to lay the foundations for trauma systems in India, and improved trauma care in much of Australia. They will also provide needed evidence about simple trauma system interventions that could be implemented in most countries without the need for major health system redesign.

The AITSC had four major interventions underpinned by the development and introduction of an in-hospital trauma registry:

1. **Introduction / Evaluation of Pre-Hospital Notification in India**
2. **Trauma Reception & Resuscitation Decision Support System**
3. **Introduction / Evaluation of a Trauma Quality Improvement Meeting (TQIM)**
4. **Rehabilitation Prescription Allowing Injury Recovery (RePAIR) – RCT**

*For full list of investigators and further information please see website: www.aitsc.org.au

The AITSC is laying the foundation for the development of trauma systems in India. In 2017 a fifth, self-funded site was added to the AITSC, the Rajiv Gandhi Government General Hospital, Tamil Nadu, joined the AITSC in August 2017. A two-day AITSC Wrap Up Conference was held March 12th and 13th, 2018.



DEVELOPMENT / INTRODUCTION OF AITSC REGISTRY

LEAD INVESTIGATOR: Gerard O'Reilly, Nobhojit Roy, Vineet Kumar, Madonna Fahey

Using the experience of running the Australian Trauma Registry and aligning with the World Health Organisation draft minimum data set, an 81-item AITSC trauma registry was developed and implemented in the four sites. The data items consisted of core and intervention data fields. Two data collectors at each site collect trauma data from pre-hospital until patient discharge.

Data collection commenced on 1 May 2016 after an extensive period of trialling and auditing.

The first-year of in-hospital data was presented to the sites and Indian Government in 2018.

For more information, please see page 57.

AUSTRALIA-INDIA TRAUMA SYSTEMS COLLABORATION

1. INTRODUCTION / EVALUATION OF PRE-HOSPITAL NOTIFICATION IN INDIA

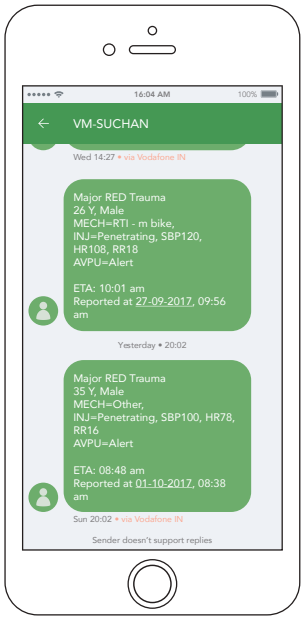
LEAD INVESTIGATORS: Joseph Mathew, Biswadev Mitra, Amit Gupta, Pankaj Patel, Satish Dharap Vineet Kumar, Advait Thakor, Teresa Howard

Pre-hospital notification is the communication by EMS personnel to a receiving hospital of the impending arrival of a patient requiring emergency care. It is an integral component of an advanced pre-hospital care system. Early in the project an environmental scan of each of the four participating sites was conducted. The results showed that in three of four sites the use of a dedicated phone ('Bat phone') would not work in the Indian ED's, mainly due to limited infrastructure, over-crowding, noise and lack of dedicated medical personnel.

In addition, none of the pilot sites had an operating or reliable PA system; with most doctors communicating with each other via smartphones. In the last decade India has emerged as a technology leader being the 3rd largest start-up hub in the world, and is the world's second biggest smartphone market. Hence it was logical to develop technology based system to communicate the arrival of a serious injured patient to the hospital.

Working with pre-hospital providers the AITSC developed a simple fast android application, Suchana,that will facilitate the notification of imminent major trauma cases from ambulance to the emergency department of the pilot trauma hospitals in India. For more details on Suchana, please see page 32.

A prospective observational study was commenced in May 2017 in selected ambulances in two sites. The first notification of a red trauma patient was received on 22nd May 2017, a 25-year-old female injured in a high-speed road traffic accident with a suspected skull fracture. The notification triggered a trauma call out and trauma team activation. This was the first-time pre-hospital notification has occurred in an Indian setting in a formalised system.



2. TRAUMA RECEPTION & RESUSCITATION DECISION SUPPORT SYSTEM

LEAD INVESTIGATORS: Mark Fitzgerald, Amit Gupta, Sangeev Bhoi, Yen Kim

The TRR© System, developed in Melbourne, Australia, provides hospital trauma teams with access to computerised decision support for the first 30minutes of trauma management. The system depends on evidence-based medical algorithms. Patient data including vital signs, confirmed and/or unconfirmed diagnoses and treatments are entered into the TRR® System directly from a monitor or by the Trauma Nurse Leader.

The Trauma Reception and Resuscitation (TRR©) System was adapted to the Indian setting and installed at the JPN Apex Trauma Centre, AIIMS, in Delhi. It provides Indian hospital trauma teams with access to computerised decision support for the first 60 minutes of trauma management. A prospective pseudo-randomised controlled trial to determine the effectiveness of the TRR System to improve patient care in a trauma centre in India.

Installation, training of staff and piloting of the system was conducted at AIIMS from 30 March to 5 April, 2018. On May 29th, the system was demonstrated as part of the Victorian Health Minister, The Honour able Jill Hennessy's visit to JPN Apex Trauma Centre at AIIMS.

The results showed that more data were recorded by staff using the TRR© system including greater neurological observations. In addition, interventions such as chest x-rays were performed much quicker when TRR system was in use. The data is currently being analysed and will be the subject of a peer-reviewed publication in 2019.

For more information about the TRR (copyright) system please see page 35.

3. INTRODUCTION / EVALUATION OF A TRAUMA QUALITY IMPROVEMENT MEETING

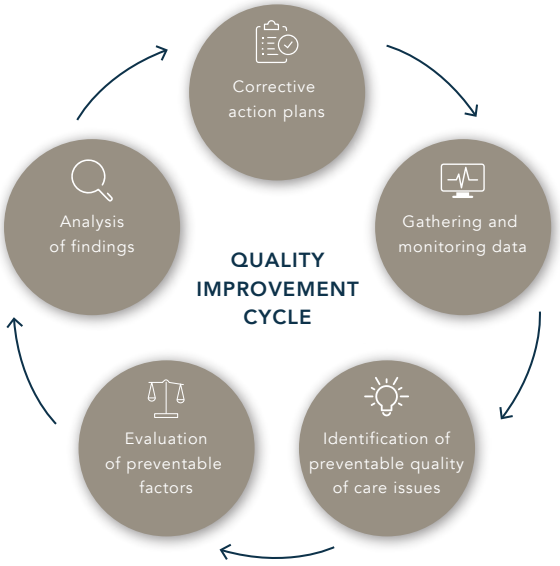
LEAD INVESTIGATORS: Gerard O'Reilly, Nobhojit Roy and Manjul Joshipura

A core component of all Trauma Quality Improvement programs is the TQI meeting (TQIM). TQIM's are a means to strengthen trauma QI and have the goal of identifying and correcting problems. In Thailand, regular M&M meetings and preventable death reviews were associated with a one third reduction in preventable death rate within two years.

The aim for the AITSC was to develop and introduce a structure to TQIMs, through the development of an android application, forming the backbone of TQIP's in India. A checklist of key components of a TQIM was developed referencing the "WHO Guidelines for trauma quality improvement programs." (Mock C, Juillard C, Brundage S, et al (editors). Geneva: World Health Organization, 2009.)

Using this checklist, a simple android application, TraumaMeet was developed that can be used by hospitals to deliver a structured TQIM, capturing attendance, meeting and case details, potential improvements in care and corrective actions.

The app provides PDF reports at the end of each meeting that can be sent to the relevant parties. Loop closure is facilitated by prompting users of outstanding case reviews at the beginning of each new meeting. A web-based back end collects data. A prospective observational study commenced in 2017 and was completed in 2018. The data is being analysed and will be the subject of a peer-reviewed publication in 2019. For more information on TraumaMeet please see page 33.



4. REHABILITATION PRESCRIPTION ALLOWING INJURY RECOVERY (REPAIR) – RCT

LEAD INVESTIGATORS: Rebecca Ivers, Sushma Sagar, Nehal Shah, Joseph Mathew and Lalit Yadev

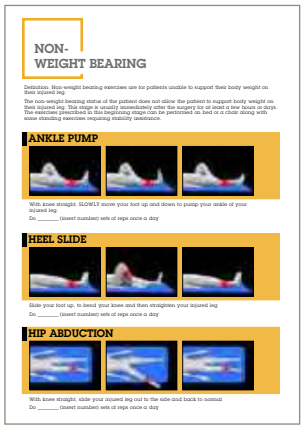
Studies of medium-to long-term recovery have shown that functional and quality-of-life outcomes of trauma patients who survive to hospital discharge are substantially influenced by post-hospital treatments, care and support. In India and some parts of Australia, physical, cognitive and other rehabilitation resources are often unavailable, or are piecemeal, poorly organised, and difficult to access. Where no services are available, the majority of rehabilitation may be delivered by family, but there is no available evidence on effectiveness of such approaches.

The aim of the AITSC rehabilitation intervention was to evaluate the effect of a home-based physiotherapy rehabilitation program for trauma patients with lower limb fractures on functional outcomes, post-discharge complications and quality of life, in three Indian trauma centres. In 2015 –2016 an observational study was conducted in three sites in 300 patients, to establish standard care in India for adults with lower limb fractures showed poor functional outcomes at 6 weeks in all age groups that marginally improved at 12 weeks.

Following the observational study a paper-based rehabilitation prescription for adults with lower limb fractures was developed,based on the physiotherapy exercise manual used at the Alfred, adapted for Indian setting by investigative team. A prospective randomised controlled trial (RCT) of this paper-based prescription (the RePAIR trial) was commenced in 2017 in three Indian hospitals. The RePAIR trial aims to evaluate the effect of this prescription on functional outcomes, post-discharge complications and quality of life.

The RePAIR trial concluded in the middle of 2018. The results of the observational study and RCT will be the subject of two peer-reviewed publications in 2019.

In addition, an android application, RePAIR, was also developed. RePAIR (see page 34 for details).



TRAUMA RECEPTION AND RESUSCITATION: HEADS-UP DISPLAY PROJECT

LEAD INVESTIGATORS:	Mark Fitzgerald, Yesul Kim, Peter Finnegan, Kon Mouzakis, WK Chiu
COLLABORATORS:	NTRI, the Alfred, Deakin University, Ambulance Victoria, Monash University
FUNDING:	MIME Seed Funding Grant, Alfred Health Research Trusts
PROJECT DURATION:	Commenced: January 2017 | Expected Completion: June 2020
PHD STUDENT:	Chris Groombridge, Andrei Florescu
SUPERVISORS:	Mark Fitzgerald, DeVilliers Smit, Frada Burstein, Yesul Kim

Resuscitation errors can contribute to preventable mortality as well as prolonged intensive care unit (ICU) and hospital length of stay. These errors are manifested through a combination of time pressure, inexperience, reliance on memory, multitasking and failures in trauma team coordination. The TRR© system has been demonstrated to reduce errors and patient morbidity by providing real-time computer-aided decision support during the first 30 minutes of trauma management. Developed and currently used at the Alfred hospital, the system utilises medical algorithms, together with patient specific information and vital signs, to advise the trauma team members of life saving interventions. Furthermore, it facilitates team coordination and communication during this challenging emergency setting.

Current utilisation rates at the Alfred of 70-80% reflect the usage barrier associated with a dedicated nurse scribe required to run the system. In order to extend its usability throughout the hospital, we aimed to develop a wearable Heads-Up-Display (HUD) device with TRR© framework, 4G wireless connectivity and voice recognition interactivity. Through its portability, the TRR© HUD will standardise resuscitation for other medical emergencies including the pre-hospital setting.

The Alfred Research Trusts grant has been awarded to develop a HUD with demonstrated usability and functionality in the trauma bays at the Alfred Hospital. Importantly, we hope to reduce errors and cognitive load with the capability to machine learn and promote quality & improvement over the years to come.

To date, we have successfully built a TRR© version for HUD with a working emulator and completed initial hardware testing. Preliminary observations indicate sound voice recognition and easily identifiable interface display. Currently, we are rewriting the TRR© system in Java to allow for interaction and integration with new technologies such as the HUD. We hope to begin the clinical trials at the Alfred Hospital by mid-2019.

The TRR© HUD will also allow the trauma team leaders to provide remote decision support to ambulance officers and obtain a direct video streaming of the patient at scene. In a TAC funded initiative titled “Ambulance Victoria HUD decision-support technology usability and effectiveness evaluation”, we are extending the potential use of HUD to the pre-hospital setting. Similar to trauma management at the hospital, paramedics routinely make critical decisions at scene about patient care. Moreover, they collect valuable information during this time, which will transfer for the severely injured patient reception and resuscitation upon hospital arrival. Importantly, this technology is expected to significantly aid air ambulance officers with prolonged field care time as well as the rural Victoria roadside accidents. This project commenced in July, 2018 and is expected to be completed by June 2020.

SEMI-AUTOMATED PLEURAL DECOMPRESSION DEVICE (SAPD©) DEVELOPMENT PROJECT

LEAD INVESTIGATORS: Mark Fitzgerald, W.K. Chiu, Peter Finnegan, Nabil Chowdhury, Yesul Kim

COLLABORATORS: Department of Mechanical Aerospace Engineering (MIME), Monash University

FUNDING: Monash Institute of Medical Engineering, Monash University

PROJECT DURATION: Commenced: 2016 | Completion: Ongoing

Tension Pneumothorax (tPTX) is a condition in which air becomes trapped under pressure in the pleural space following lung injury. This injury can quickly become life-threatening if untreated. tPTX has been identified as a main contributor to preventable death in civilian trauma systems and in combat environments. Decompressing the pleural space and venting air is the definitive emergency intervention for tPTX. Failure to decompress a tPTX is a well-recognised cause of avoidable, early trauma deaths. The proposed innovative device is designed to ensure safe, rapid, deployable and successful pleural decompression in trauma care. The Semi-automated Pleural Decompression device (SaPD© Alfred Health and Monash University, 2016) has been engineered with clinical as well as biomedical expertise to best address the reported failures of current procedures.

The currently utilised technique of blindly inserting a needle into the chest has significant failure and complication rates. The benefit of utilising the SaPD© includes proper placement and penetration point, chest wall fixation as well as an innovative assembly that allows for safe air and fluid extraction without the risk underlying lung or heart injury.

Additionally, the base plate is equipped with two electrodes for vital signs monitoring. This is highly useful in a pre-hospital setting as the base plate can be applied on **all** major trauma patients, on each side of the patient's chest, to monitor vital signs and provide a sterile 'safe' zone area.

To date, the development of a prototype was achieved with the technical expertise from the Department of Mechanical aerospace engineering and the clinical insights from the doctors at the Alfred hospital. Subsequently, a pre-clinical trial was completed in September 2017, using the prototype model where the SaPD© was superior in its deployment and safety compared to that of more conventional methods. Lastly, an International Patent PCT phase has been filed in November last year.

The NTRI project manager and the Monash Innovations team has been engaging with various investors and potential partners for this technology, including major medical devices companies as well as the military for combat casualty setting.

We envisage the SaPD© device could be used in major trauma patient in Victoria as the "gold-standard" as a diagnostic and therapeutic tool for tPNX and vital signs monitoring method during pre-hospital resuscitation. This technology will not only improve patient outcomes, but also promotes local talent and the Victorian Government initiative to sustainably develop the economy through industry and manufacturing.

BIOBIT II STUDY: DIAGNOSIS AND FOLLOW-UP OF CONCUSSION AFTER MILD TRAUMATIC BRAIN INJURY

LEAD INVESTIGATORS: Biswadev Mitra

KEY PERSONNEL: Jeffrey Rosenfeld, Catherine Willmott, Jason Watterson, Alexander Olaussen, and Nanda Surendran

FUNDING: Defence Health Foundation

PROJECT DURATION: Commenced: 2018 | Completion: 2019

Mild trauma to the head is common, in particular, during combat training and contact sports. Concussion is a disturbance in brain function caused by direct or indirect force to the head. Concussion typically results in the rapid onset of short-lived brain impairments that resolve spontaneously in most cases. In the short term, second impact syndrome can occur if the injured individual returns to activity before full resolution of a concussion and a second impact may cause pathologic conditions such as vascular congestion, cerebral oedema (swelling of the brain), increased intracranial pressure, and ultimately coma or death, although this is uncommon. More commonly, those with concussion have increased risk of recurrent injury, and epidemiological studies suggest risk of long term cognitive deficits with multiple concussions.

It is therefore essential that governing bodies accurately diagnose concussion and resolution, to determine a safe time to return to activities. The subtle changes from a concussion may not be identifiable through standard orientation questioning or traditional balance testing, that are frequently limited by absence of baseline testing, conditioning and subjectivity. Newer imaging modalities (e.g., functional magnetic resonance imaging) have limited evidence, are not readily available, and are yet to have fully established clinical applications. Such limitations place individuals at risk of the adverse effects of concussion and governing bodies at risk of long-term culpability from inadequate assessment.

A number of biomarkers of injury to different cell types and structures within the brain can be detected in peripheral blood, including S100-ß and glial fibrillary acidic proteins. The utility and detection of these biomarkers has been limited due to altered expression secondary to the blood-brain barrier and paucity of clinical evaluation. A recent feasibility study that assessed biomarkers in patients with traumatic brain injury presenting to an Emergency Department, identified two biomarkers — mir142-3p and mir423-3p –with potential utility to distinguish severity and improvement over time named (Mitra B, et al. J Clin Neurosci. 2017;38:37-42)

The primary objective of this study is to assess the novel biomarkers in conjunction with routinely used cognitive tests to evaluate participants who suffered an injury to the head and are considered to be at risk of concussion or post- concussion syndrome. The secondary aim is to assess these biomarkers along with cognitive testing over 4 weeks to correlate changes in biomarker levels to cognitive tests.

All 30 patients with mild brain injury and the 30 healthy controls will be enrolled as a convenience sample. For the TBI cohort, a venous blood samples will be collected at time points 0, 7 and 28 days after injury along with the cognitive testing. The control cohort will have a baseline blood test and cognitive testing, as well as follow-up cognitive testing to account for any learned component.

BIOCAB STUDY: BIOMARKERS IN CEREBROSPINAL FLUID (CSF) AND BLOOD IN SEVERE TRAUMATIC BRAIN INJURY (STBI) PATIENTS

LEAD INVESTIGATORS: Biswadev Mitra

KEY PERSONNEL: Annie Carter, Robert Medcalf, Dominik Draxler, Dashiell Gantner, Rhondhir Jithoo, and Martin Hunn.

FUNDING: Alfred Health Small Grants

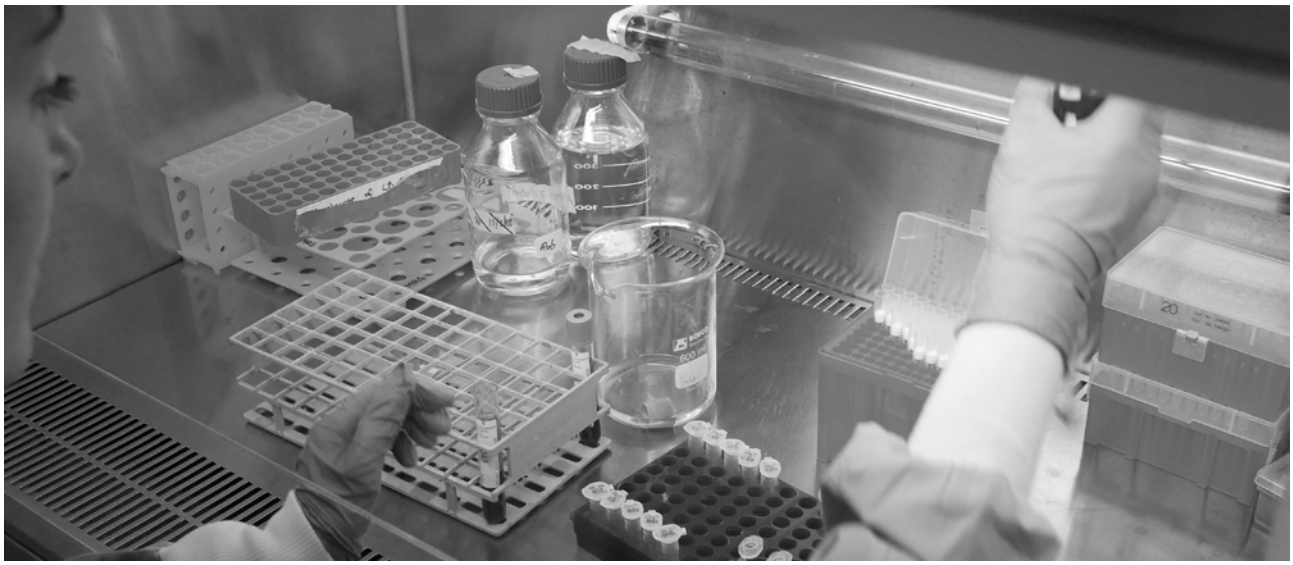
PROJECT DURATION: Commenced: 2018 | Completion: 2019

Severe traumatic brain injury (sTBI) is associated with substantial mortality and long-term disability in survivors. Despite advances in resuscitation, there have been minimal improvements to outcomes of patients after sTBI. Research into novel targets for reversal of injury are essential. Identification of plasma biomarkers to predict complications after traumatic brain injury (TBI) may assist in prediction and management of patients, and may facilitate trials to evaluate new pharmacological treatment options for TBI patients

This prospective, non-randomised, observational cohort study aims to identify plasma biomarkers that may predict harmful blood brain barrier (BBB) opening in patients following sTBI.

Cerebrospinal fluid (CSF) and blood collected from adult patients, admitted to the Alfred ICU with sTBI requiring extraventricular drain (EVD) (sTBI cohort), and from adult patients admitted to the Alfred Emergency Department being investigated with lumbar puncture (non-sTBI cohort), will be analysed for protein levels (e.g. t-PA and albumin) and enzymatic activity (e.g. of plasmin).

The study will determine if there are phases of BBB opening and closing following sTBI. It is anticipated that BIOCaB will help elucidate the time course of increased BBB permeability following sTBI and indicate when therapy targeting this issue can be considered most effective. More broadly, the study aims to facilitate future trials to evaluate new pharmacological treatment options for TBI.



SCREENING FOR PREVALENCE OF ILLICIT TOXINS IN EMERGENCY DEPARTMENT TRAUMA (SPIT-T): AN OBSERVATIONAL STUDY

LEAD INVESTIGATORS:	Biswadev Mitra, Jeffrey Rosenfeld, Catherine Willmott, Jason Watterson
KEY PERSONNEL:	George Braitberg, Marie Gerdtz, Celene Yap, Catherine Daniel, Laura McEntaggart
COLLABORATORS:	Melbourne Health, University of Melbourne, Royal Melbourne Hospital
FUNDING:	Transport Accident Commission
PROJECT DURATION:	Commenced: 2018 | Completion: 2019

In the 2015 Victorian Road Trauma report, VicRoads reported that approximately 12% of deaths and serious injuries on Victorian roads were associated with alcohol and illicit drug driving. Drugs and alcohol were suspected to be involved in half the fatalities of 16 to 17-year-old passengers. There is a substantial overlap between illicit substance use and risky drinking with almost 10% of all poly-drug users engaging in both risky drinking behaviour and illicit substance use.

Population level data collected in 2013 demonstrated a 6.2% increase in the proportion of methamphetamine users in Australia consuming the drug daily or weekly when compared to the rate reported in 2011. However, real-time detection of illicit substances is limited and seldom performed and in most cases drug screening results are not known until after the patient has left the Emergency Department (transferred home or admitted to hospital or died).

This prospective observation study, being conducted at the Royal Melbourne Hospital and The Alfred, is looking at the prevalence of illicit substance use on ED presentations involving major trauma. The participating sites are The Alfred Hospital and The Royal Melbourne Hospital.

The study uses saliva tests for five commonly used illicit substances: cannabis, amphetamines, methamphetamines, opiates, cocaine. Additionally, the current processes of care are mapped in order to establish baseline data and identify opportunities for improving care, particularly discharge planning.

We anticipate that the project outcomes will provide information about: the prevalence of the designated illicit substances in major trauma patients; the trauma mechanisms, injury characteristics and severity; the ED and hospital length of stay; cost of management; and the ED representation rates (within 28 days). We anticipate that these outcomes will inform the TAC about the success of current drug and driving campaigns, the need for further interventions and costs of management, and inform the next generation of TAC drug-driving campaigns.

PRE-HOSPITAL WIRELESS 4G TRR© HEADS UP DISPLAY PROJECT

LEAD INVESTIGATORS: Mark Fitzgerald, Peter Finnegan, Yesul (Yen) Kim

COLLABORATORS: Monash Institute of Medical Engineering (MIME), Deakin University, Ambulance Victoria

FUNDING: Transport Accident Commission

PROJECT DURATION: Commenced: 2018 | Expected Completion: 2020

Inherent in any resuscitation situation is the potential for error, which is a significant contributor to patient harm. The potential for errors that underlie road-trauma setting is increased due to the unique challenges of the complex environment including fire, vehicle damage, a lack of medical resources, inadequate physiological monitoring capabilities and cognitive overload. The introduction of a system which contributes to error reduction by providing real-time, evidence and experience-based support to decision makers in the field is required to reduce errors and improve patient outcomes.

The Trauma Reception and Resuscitation (TRR©) system, developed at The Alfred, significantly reduces trauma resuscitation errors and morbidity by providing real-time computer-aided decision support to hospital trauma teams in the first 60 minutes of trauma management. As a result, shock management errors were reduced, haemorrhage control improved, blood and fresh frozen plasma transfusions were reduced, and airway management improved, with the incidence of aspiration pneumonia halved.

The current TRR© system at the Alfred requires a dedicated scribe nurse inputting a touch screen monitor Funded by grants from the Alfred Research Trust and MIME the research team is working to develop a hands-free, optical head-mounted display with speech recognition to transmit real-time information to medics on field as well as to remote medical experts.

The Heads-Up Display (HUD) will utilise proven computer based algorithms already in operational with the TRR© system to provide decision support via action-based prompts for goal-directed treatment and diagnosis.

This project extends the TRR© decision support technology to the at-scene responding paramedics, adapting the software for pre-hospital needs, evaluating its use on the bench and piloting in the field. The primary outcome will be the development of a cost-effective, adaptable and field-operational wearable device that will provide critical assistance for lifesaving interventions. The demonstration of this technology is expected to significantly aid roadside trauma care across diverse scenarios encountered in such an environment.

The project commenced in 2018 involves two phases. Firstly we will establish clinical and technical protocols to assist the implementation of standardised data transfer and tele-consultations. Then in phase 2, we hope to evaluate the feasibility and effectiveness of the device including the improvement of situational awareness and decision support provided by remote experts.

TRAUMA SYSTEM – STATEWIDE

KEY PERSONNEL: Joseph Mathew, Mark Fitzgerald, Ellaine Boo, Emma Lim (Program Manager)

FUNDING: Transport Accident Commission

PROJECT DURATION: Commenced: 2018 | Expected Completion: 2020

The introduction of the Victorian State Trauma System in 2000 has saved many Victorian lives, and reduced the disability from trauma significantly. In Victoria, meeting the education and training needs of health professionals was identified as one of the key priorities in the five-year strategic framework for the continuing development of the VSTS.

The initial assessment and treatment of critically injured patients is time sensitive, and often the key variable in the success of treatment and reduction in morbidity. The introduction of the multidisciplinary trauma team approach has done much to alleviate this stress. Trauma Teams ensure the early mobilisation and involvement of the most experienced medical staff to treat the patient. Teams make fewer mistakes than do individuals, especially when all team members know their individual responsibilities as well as those of the other team members. Currently there is no consistent approach across the State of Victoria for trauma reception and resuscitation (TRR) management within trauma teams.

The Trauma Team Training Project aims to rectify this by delivering an adapted version of "The Alfred Trauma Reception and Resuscitation Training" program to trauma teams in adult major trauma centres throughout Victoria. The project will also evaluate the training and also develop the capacity of a regional trauma team training program.

OBJECTIVES:

- Implementation of a contextualised simulated multi-specialty trauma team training course in Victoria for staff involved in trauma reception and resuscitation (doctors, nurses, clerical and ancillary).
- Conduct qualitative assessment by using validated self-reported and observational tool pre, immediately post and 12-weeks post training
- Identify change champions throughout training and conduct train the trainer programs (year 2)

The project commenced in 2018 with the appointment of a Trauma Team Training project manager, development of the Trauma Team Training program, purchasing of equipment and development of evaluation tools. The first Trauma Team Training program will be held in March 2019, with subsequent programs across 2019 and 2020.

MAXIMISING THE USEFULNESS AND TIMELINESS OF TRAUMA AND EMERGENCY REGISTRY DATA FOR IMPROVING PATIENT OUTCOMES

FUNDING: NHMRC Early Career Fellowship (ECF)*

NHMRC FELLOW: Gerard O'Reilly

SUPERVISOR: Mark Fitzgerald

PROJECT DURATION: Commenced: 2018 | Expected Completion: 2021

Developed trauma care systems are supported by trauma registries which are intended to inform improvements in trauma care. But invariably, they do not provide useful information in a timely fashion; most are cumbersome houses of extensive data generating periodic reports for publication. Translating, in real-time, clinically useful trauma registry data into interventions to improve care, using innovative processes and technological applications, would lead to a reduction in deaths, disability and healthcare costs.

The aim of Gerard's ECF fellowship is to develop and evaluate the processes and technological applications to make trauma registry data useful, relevant and timely for informing the care of the injured patient real-time i.e. during their hospital stay, that will lead to better interventions and a reduction in deaths and disability.

OBJECTIVES:

- Determine current approaches to improving data quality, including its usefulness. Using three levels of trauma registry based at the campus of Australia's largest trauma service (Alfred Trauma Registry, Victorian State Trauma Registry, National Trauma Registry).
- Derive and validate metrics for measuring data quality, including usability, timeliness and cost-effectiveness.
- Identify how registry-derived predictors of important outcomes (death, length of stay, complications, function) can be used, real-time and through portable technological devices, to tailor and improve the current care of individual trauma patients.

OUTCOMES:

- Become a leading expert in translating trauma (and indeed any disease) registry data into improved patient outcomes, at hospital, state, national and global levels.
- Developed technological applications necessary to improve real-time meaningful patient outcomes, allowing emergency and trauma clinicians to use data to improve patient care on a daily basis.

The project commenced in 2018. The first publication from this ECF was accepted in 2018 - O'Reilly GM, Fitzgerald MC. Integrating trauma registry data into real-time patient care.. Emergency Medicine Australasia. (In press)

*NHMRC Early Career Fellowships are only conferred to top performing researchers who have the potential to undertake research that will have major significance to that field of research.

BIOTECHNOLOGIES

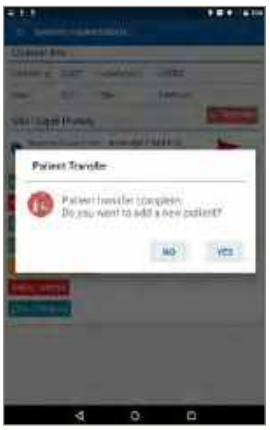
SUCHANA©

Suchana© is a fast android application, that facilitates the notification of imminent major trauma cases from ambulance to the emergency department of the pilot trauma hospitals in India. The algorithms were developed using principals of the 'MIST' criteria (Mechanism, Injuries, Signs & symptoms, Treatment), minus the 'T' for treatment; and in combination with CDC and AIIMS criteria for trauma flags. It is a series of 10 pages with drop-downs or simple data entry; and uses Google Maps to generate an ETA.

With a few short key-strokes simple patient data can be entered into the application by the emergency medical technician in the ambulance, generating a trauma triage flag based on a Red, Yellow, Green traffic light system.

Suchana© notifies a specified trauma doctor or trauma nurse coordinator in the ED of any serious trauma (Red trauma flag) en-route, this person activates the RELAY app that sends a simple SMS to all doctors on-call, allowing them to prepare for the patient. Suchana© was developed within the Australia-India Trauma Systems Collaboration (see page 18).

Suchana© is currently available for license or research purposes.



TRAUMAMEET©

TraumaMeet

TraumaMeet© is checklist a simple android application that can be used by hospitals to deliver a structured TQIM.

TraumaMeet© captures multi-disciplinary attendance, meeting and case details, potential improvements in care and corrective actions. The app provides PDF reports at the end of each meeting that can be sent to the relevant parties.

Loop closure is facilitated by prompting users of outstanding case reviews at the beginning of each new meeting. A web based back-end collects data. TraumaMeet© was developed within the Australia-India Trauma Systems Collaboration (see page 20).

TraumaMeet© is currently available for license or research purposes.

REPAIR©

Rehabilitation applications are increasingly used in healthcare scenarios, particularly due to the widespread use and availability of smartphones. Current apps mainly target post acute hospital settings, however, there is an enormous potential for use in a trauma setting.

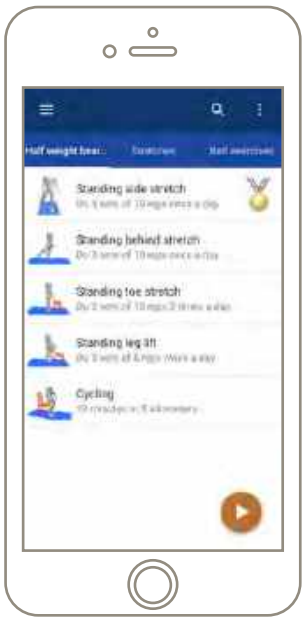
A smartphone post-trauma rehabilitation app would be especially useful to patients living outside of metropolitan areas or in locations, such as India and China, where access to specialist rehabilitation is limited. RePAIR© is an android proof of concept smartphone/tablet application, developed as part of the Australia-India Trauma Systems Collaboration, to be used by patients at home to deliver a post-trauma physiotherapy prescription.

RePAIR© is a series of 30 physiotherapy exercises, designed for isolated single limb long bone leg fractures, were transformed into 3D animations divided into non-weight bearing, partial weight bearing, full weight bearing, and high impact exercises.

A web-based back-end was developed to allow doctors and physiotherapists to: Add/remove a patient; select specific exercises and number of repetitions depending on patient ability; check patient progress/completion data; remotely review and update exercise program; and export data. Patients download the app onto their smartphone where the list of exercises assigned to them is populated on the screen. Each exercise is depicted as an animation and contains the number of repetitions required. The app sends reminder notifications to the patient up to 3 times daily, and rewards compliance with a with a virtual 'prize'.

RePAIR© is due to be piloted in Australia in 2018. Subject to the pilot, the scope of the application will be extended to include a wider range of post-trauma physiotherapy injury information, advice and follow-up appointments; converted to IOS; ahead of a randomised controlled trial.

RePAIR (copyright) was developed within the Australia–India Trauma Systems Collaboration (see page 21).



TRAUMA RECEPTION AND RESUSCITATION (TRR®)

Trauma Reception and Resuscitation

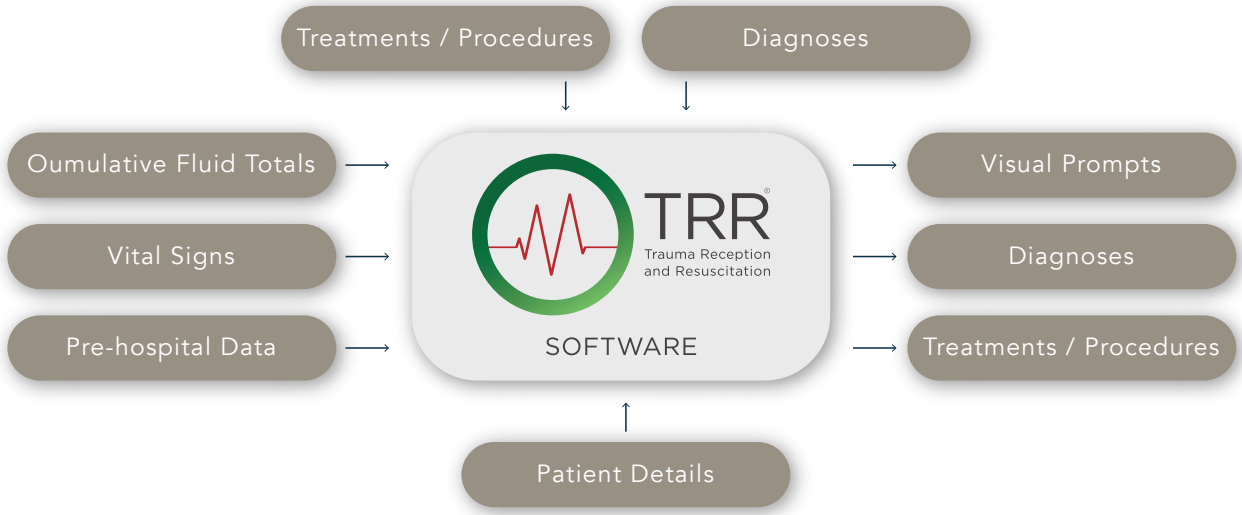
The TRR® System developed in Melbourne, Australia, provides hospital trauma teams with access to computerised decision support for the first 30 minutes of trauma management. The system depends on evidence-based medical algorithms. Patient data including vital signs, confirmed and/or unconfirmed diagnoses and treatments are entered into the TRR® System directly from a monitor or by the Trauma Nurse Leader.

Based on this data, computerised algorithms prompt the Trauma Team in real time to confirm the state of the patient, perform procedures and administer drugs as well as assisting with diagnosing injuries.

The Trauma Team view prompts and patient data on a large overhead monitor mounted on the wall of the Trauma Bay. In this way, compliance to the algorithms is guided by real time computer generated prompts linked to real-time, patient-specific data collection.

TRR® software provides greater decision support by reducing error, enhancing team coordination and allowing detection of response to decision support prompts. Such an approach allows iterative validation of the decision support system's performance and identification of details about clinician performance not found in other quality improvement processes.

The TRR® decision support software is currently available for license and or research purposes. It can be adapted to local setting under agreement.



TRR© HEADS-UP DISPLAY (HUD)

Following the effectiveness of TRR© decision support system at the Alfred during the past decade, we face potential barriers for use and areas of improvements with the introduction of advanced technologies. This project aims to allow for direct user inputs by members of the trauma team via wearable HUDs and concurrently, receive real-time action prompts as well as remote expert decision support when needed.

The TRR (copyright symbol) HUD technology shows great potential for paramedics to relay patient information to the receiving facility as well as having an access to tele-consultations.

Funding from the Alfred Trusts Major Research Grant scheme currently supports the development of an optimal software interface for wearable HUDs with the TRR© system.

They also support development and testing of Wi-Fi connectivity with the Philips patient monitoring system and TRR CPUs within the Alfred Trauma Centre Resuscitation bays; examination of the new HUD interface for safety, reliability and usability; testing HUD 4G connectivity for remote expert task guidance and decision support; and lastly, conducting clinical trials comparing outputs from the new HUD interface and Wi-Fi/4G connectivity with the current TRR© system and cubicle touchscreen device. Most importantly, the innovations attached to this project have far-reaching, global implications in resuscitation procedures including disaster response to combat casualty settings.

SYSTEMS DEVELOPMENT

INTRODUCTION

Trauma systems save lives, both in the pre-hospital and in-hospital settings. In some countries, the current death and disablement rates can be reduced by up to 75% just by introducing the key components of a trauma system and developing trauma care capacity. The Alfred and NTRI have delivered programs in trauma system development and capacity building in China, Ethiopia, India, Iran, Myanmar, Papua New Guinea, the Philippines, Qatar and Sri Lanka.

The Alfred Trauma Services and NTRI also have experience in providing consultation to the designation of Level 1 to Level 3 hospitals internationally. Figure on page 42 shows the range and scope of the systems development programs that have been or are currently being delivered by the Alfred/NTRI.

We have provided state-wide trauma systems development plans for India, Myanmar, Saudi Arabia and some provinces in China. Some of the key systems development components that we deliver are listed below.

TRAUMA SYSTEMS GOVERNANCE

An appropriate structure to ensure oversight, governance and development of a long-term population based inclusive trauma system.

TRAUMA REGISTRY

Collecting and analysing information about trauma patients, their management and their injury outcomes informs future improvements to health service provision and development, with the long term societal aim of reducing preventable deaths and permanent disability as a result of injuries. A trauma registry is a prerequisite for the successful implementation of trauma quality improvement programs. The NTRI is home to the Alfred Hospital Trauma Registry and also the Australian Trauma Registry (a collaboration of the 26 major trauma centres across Australia supported by the Australian Government). It has also established in-hospital trauma registries in India, China, Saudi Arabia and Myanmar.

DESIGNATION OF TRAUMA CENTRES

The designation and establishment of Level I, Level II and Level III trauma centres are key to the success of a trauma system. The NTRI works with key stakeholders to identify the appropriate locations and refurbishments of each trauma centre, working on the premise that where possible refurbish and renovate existing centres.

PRE-HOSPITAL SYSTEM

A successful trauma system requires robust trauma call-out criteria and trauma care. A key component is the need for pre-hospital notification – the communication of ambulance personnel to emergency department staff.

TRAUMA SERVICE DEVELOPMENT

High quality trauma care within a trauma system requires the procedures and processes of each specialty working with trauma patients to be fully integrated. A robust trauma quality improvement program is also required/ The NTRI can provide specific and localised protocols and processes, audits, structured trauma quality improvement processes, and develop the template for future dissemination.

TRAUMA RECEPTION & RESUSCITATION

A coordinated and systematic approach to the resuscitation and surgical management of the severely injured patient is a key factor saving lives. The NTRI can deliver trauma reception and resuscitation training, for doctors and nurses, to reduce the errors that occur during the initial hospital reception.

CAPACITY BUILDING

Through advanced trauma physician and trauma nursing training that can be adapted to the local environment.

PUBLIC AWARENESS & TRAUMA PREVENTION

The NTRI runs a highly successful youth trauma awareness and prevention program is being adapted to the Indian setting. It can be localised to any country depending on the peculiarities of the presenting trauma.

ACTIVITIES IN THE REGION

INDIA
- Trauma Registry Development - Odisha
- Trauma Systems Development - Punjab, Kerala, Tamil Nadu
- Trauma Team Training Program - Punjab
- Australia-India Trauma Systems Collaboration - JPN Apex, AIIMS
- MOU: NTRI / Alfred and Ministry of Health and Family Welfare
- MOU: GVK-EMRI - Uttar Pradesh, State Trauma Care Plan

CHINA
- LongGang Peoples' Hospital Trauma Centre
- Design assistance, trauma reception and resuscitation training, bilateral exchange program of medical and nursing staff
- Trauma care support during World University Games in 2011
- MOU signed in 2012 for 4 years
- Southwest Hospital, Third Military Medical University, Chongging
- Development of Burns registry based on Bi-National Burns Registry in Australia

IRAN
- WHO Trauma Quality Improvement Program, Short Course

PHILIPPINES
- Australia-Philippines Trauma Program

SAUDI ARABIA
- Trauma Systems Development

MALAYSIA
- WHO Trauma Quality Improvement Program, Short Course

ETHIOPIA
- WHO Trauma Quality Improvement Program, Short Course

SRI LANKA
- Health for the South Trauma Project
- Trauma Quality Improvement Training
- Oversaw building of new E&TC Hospital Galle
- Ongoing training and advice

VIETNAM
- Emergency & Trauma Team Training Program

AUSTRALIA
- Various projects including AusTQIP, a collaboration of 26 Australian Major Trauma Services and 5 Trauma Services from New Zealand, and the Australia New Zealand Trauma Registry.

CHINA

PROJECT:	Longgang Central Hospital: The Alfred Trauma and Critical Care Centre Collaboration Program (ongoing)
KEY PERSONNEL:	Mark Fitzgerald and Ellaine Boo
FUNDING:	Shenzhen Health and Family Planning Department
DURATION:	Commenced: April 2018 | Expected Completion: April 2022

Longgang Central Hospital (LCH) of Shenzhen is being expanded to a 2,000 bed hospital. The Shenzhen Health and Family Planning Department intends to establish LCH as a Premier Teaching Hospital in order to provide better health services for the residents.

Included in the planned LCH redevelopment is the building of a new Trauma and Critical Care Centre. Alfred Health will assist LCH to further develop their emergency and trauma care, critical care and surgical care.

Linked to these activities will be the delivery of education, research, registry, biotechnology, audit and governance programs at LCH.

Trauma Team Training Workshop, May 2019

CHINA

PROJECT:	Huizhou First People's Hospital: Trauma System Development Project (Completed)
KEY PERSONNEL:	Mark Fitzgerald and Ellaine Boo
FUNDING:	Huizhou First People's Hospital
DURATION:	Commenced: March 2016 | Completed: March 2019

According to China's National Center for Health Information and Statistics, trauma is the leading cause of death and disability for children and adults aged 18-40 years, mostly from road traffic injuries. However, trauma care in China is still in its infancy.

Huizhou First Hospital (HFH) is a 750 bed tertiary hospital in Huizhou, China. With increasing trauma-related injuries presentation, HFH wanted to develop a trauma care system that will significantly improve their capacity to receive and resuscitate critically ill and injured trauma patients.

In 2016, HFH collaborated with Alfred Hospital (AH) in a 3 year project to establish a trauma centre in HFH. Associated with this project are clinical, education, registry, research and biotechnology. HFH now is leading an 18-hospital Trauma Network in Huizhou.

Huizhou Trauma Network, February 2019

PROJECT: The Third Affiliated Hospital of Qiqihar Medical University
The Alfred International Trauma Program (Completed)

LEAD INVESTIGATORS: Mark Fitzgerald and Ellaine Boo

FUNDING: The Third Affiliated Hospital of Qiqihar Medical University

DURATION: Commenced: October 2015 | Completed: October 2017

In 2015, a 2-year Memorandum of Agreement between The Third Affiliated Hospital of Qiqihar Medical University (TAHQMU) and Alfred Health (AH) in Melbourne, Australia was signed for the purposes of improving trauma care at TAHQMU.

Trauma errors occur due to time pressure, inexperience, reliance on memory, multi-tasking and failures in medical and nursing staff coordination - especially during the initial minutes of patient arrival. In developed countries with established systems of trauma care, multidisciplinary trauma teams coordinate the reception of the seriously injured at the time when the patient is most at risk of preventable morbidity and mortality.

To improve patient outcomes from severe injury, specialist staff from The Alfred Hospital has delivered 'Trauma Reception and Resuscitation' training programs.

The program teaches a systematic approach to trauma resuscitation that results in reduced errors and improved patient outcomes. A unique characteristic is the combined medical/nursing 'Trauma Team' approach. The program trained 120 LCH medical and nursing staff in Trauma Reception and Resuscitation of the critically ill trauma patients. 20 LCH medical and nursing staff spend 2 weeks observership at the Alfred Trauma and Emergency Centre.

Trauma Team Training - Simulation, 2016

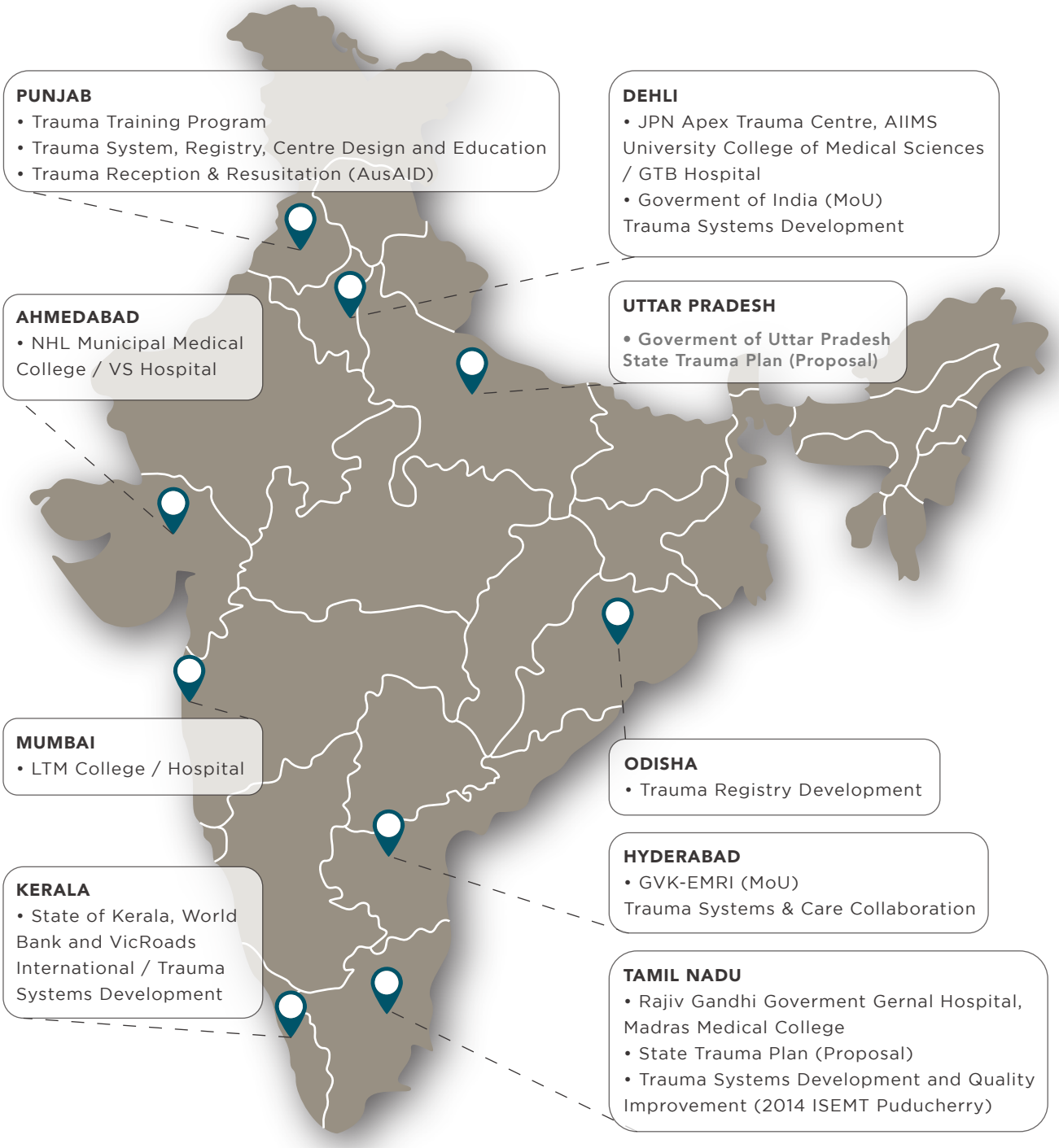
INDIA

The Alfred Trauma Service and National Trauma Research Institute (NTRI) has a broad range of high profile activities in India that are largely due to the success of the of the Victorian State Trauma System and The Alfred/NTRI clinicians and researchers who work within it.

The collaboration with India started in 2004 when Professor Mark Fitzgerald, Director of the Alfred Trauma Service and NTRI, was commissioned by the World Bank for the Government of Kerala to produce the **'Emergency Medical Assistance: The Kerala Trauma System' report.**

This report made recommendations to the Government of Kerala regarding trauma system development for the state, including trauma centre location and a sustainable funding model.

ACTIVITIES IN INDIA



AUSTRALIA-INDIA TRAUMA SYSTEMS COLLABORATION

Commencing in 2013, the Australia-India Trauma Systems Collaboration (AITSC) brings together governments, industry, clinicians and researchers to improve information and resources, and to pilot new systems of care. Led by the National Trauma Research Institute and the JPN Apex Trauma Centre at the All India Institute of Medical Sciences (AIIMS) in Delhi, the program brings together some of the world's leaders in trauma care. For more information about the AITSC please see pages 18 and 20 of this document.

In its final 3 months, The Ravi Gandhi Government General Hospital (RGGH), Madras Medical College (MMC), Tamil Nadu joined the AITSC as a self-funded site: www.atr.org.au.

RGGH, MMC aimed to rapidly implement the main technologies and interventions to demonstrate the successful collaboration with Alfred/NTRI and AIIMS ahead of a World Bank tender and the implementation of the Tamil Nadu State Trauma Plan (see below). The AITSC was completed in 2018, culminating in a 2-day wrap up conference on March 12th and 13th, in Delhi.

The AITSC allowed the NTRI and Alfred Health significant contact with India over a five-year period that has led to a number of Memoranda of Understandings (MOU's), the development of two state trauma plans, and the exposure of our training courses in India.

MOU WITH THE MINISTRY OF HEALTH AND FAMILY WELFARE

KEY PERSONNEL: Mark Fitzgerald, Joseph Mathew and Teresa Howard

In November 2013, a Memorandum of Understanding to support trauma system development in India between the NTRI/Alfred Health and the Indian Government (Ministry of Health and Family Welfare) was signed in Mumbai by Mr Andrew Way (CEO of Alfred Health) and Special Director General of Health Services, Dr Kothari to support trauma system development in India. The parties agreed to promote, encourage and develop bilateral cooperation in trauma prevention, control and management, and to develop a sustainable model of trauma care system and injury prevention for India.

Since the signing the Victorian Department of Health Services, Ambulance Victoria, Royal Melbourne Hospital, Royal Children's Hospital, Victorian Transport Accident Commission and Monash University have all been invited to join the collaboration, forming the India Australia Trauma Care Coordinating Committee with our DGHS collaborators.

In September 2015, the NTRI/Alfred, as part of the Alfred Trauma Service and the Victorian State Trauma System (VSTS), hosted a delegation from the Ministry of Health and Family Welfare, Government of India, on behalf of the joint collaboration.

The key outcomes of this visit were the consolidation of the joint partnership between India and Australia, and the identification of key trauma management projects and the strategies required for India. The initial key projects identified for implementation included the development of a National Trauma Registry India in Delhi and five states; and consultation on submitted State Trauma System Plans. This MOU continues to be invaluable as proof of high level engagement of the Alfred/NTRI in India.

MEMORANDUM OF UNDERSTANDING WITH AMBULANCE PROVIDER GVK-EMRI

KEY PERSONNEL: Mark Fitzgerald, Joseph Mathew and Teresa Howard

GVK Emergency Management and Research Institute (GVK-EMRI) is the largest provider of ambulance services in India. In 2014, a Memorandum of Understanding between the NTRI/Alfred and) was signed in the presence of the Hon. Tony Abbott, MP, then the Prime Minister of Australia. Under the terms of this MoU, NTRI agreed to work with GVK EMRI on shared goals to strengthen trauma care practices in India and collaborate in areas of trauma care.

In November 2014, the NTRI/Alfred and GVK-EMRI were invited to submit a trauma care plan for Uttar Pradesh (the largest state in Indian with 200 million people) that would pilot a model trauma system and networks linking pre-hospital and hospital based trauma care providers. This was a direct request and not part of a tender process. In May, 2015 the NTRI/Alfred and GVK-EMRI presented the "The Uttar Pradesh State Trauma Care Project – Trauma Services Development Plan 2015 2020" to Government officials.

The NTRI/Alfred along with our partners Monash University also secured four Fellowships for GVK-EMRI Indian Emergency Medical Service Technicians to undertake a Fellowship with the Department of Community Emergency Health and Paramedic Practice to work with the key tertiary trainers of paramedics in Victoria and also with Ambulance Victoria, the state-run emergency ambulance service. These fellowships were completed in September 2016.

Together we have been working on a number of research and development proposals and the development of training courses; and connecting GVK-EMRI with our Chinese health care partners. More recently, GVK-EMRI is partnering with us in Tamil Nadu as part its inclusion in the AITSC, and in the Tamil Nadu State Trauma Development Plan due to start in 2019.

TAMIL NADU TRAUMA DEVELOPMENT PLAN

KEY PERSONNEL: Mark Fitzgerald, Joseph Mathew, Teresa Howard, Ellaine Boo, Hayley Ball and Emma Lim

Tamil Nadu has the highest number of road accidents in India and the second highest mortality due to road injuries. In 2017, the Tamil Nadu National Health Ministry requested our help in the development of a state trauma registry for Tami Nadu and also to help them develop the trauma system in Tamil Nadu based on the highly successful Victorian State Trauma System. In May 2017, The Tamil Nadu State Development Plan, along with costings, was submitted to the National Health Mission, Tamil Nadu. This plan has led to a number of visits to Chennai and also to the inclusion of RGGGH, MMC, Tamil Nadu, into the AITSC.

In November 2017, senior clinical and research staff from the NTRI worked with the National Health Mission in Tamil Nadu and the Tamil Nadu Accident and Emergency Initiative (TAEI) to plan a trauma care workshop. The NTRI staff were invited to the co-developed workshop, held from 9-10 of November 2017, as key faculty and speakers presenting the key components required for a fully integrated Trauma System to improve the care of injured Tamil Nadu citizens.

In August 2018, delegates from the National Health Mission, Tamil Nadu, including the Tamil Nadu health minister, Dr Vijaya Bhaskar visited the Victorian State Trauma System after an invitation from the then Victorian Health Minister, Ms Jill Hennessy, MP. During this visit, the minister signed a letter of intent to engage The Alfred Health Trauma Service and NTRI to deliver the Tamil Nadu Development State Trauma Plan.

Under this program the NTRI and Alfred Trauma Service will work with the National Health Mission, Tamil Nadu by providing ongoing training and capacity building of all staff across the trauma patient care continuum; delivering pre-hospital and hospital software systems already tested in India (via AITSC); and developing processes and guidelines specific to Tamil Nadu trauma care needs. The project is expected to start in 2019.

MYANMAR

PROJECT:	Australia-Myanmar Trauma Management Program
KEY PERSONNEL:	Mark Fitzgerald, Gerard O'Reilly
FUNDING:	Department of Foreign Affairs and Trade, Government Partnerships for Development
PARTNER:	Yangon General Hospital Myanmar, University of Nursing (Yangon), Myanmar Orthopaedic Society, University of Medicine (Mandalay), Chiang Mai University
DURATION:	Commenced: 2014 | Completion: 2018

Injury is the leading cause of death and the leading cause of hospitalisation in Myanmar. The aim of the Australia-Myanmar Trauma Management Program AMTMP was to increase the capacity of emergency and trauma doctors and nurses in Myanmar to deliver life-saving care. The primary intended outcome was improved knowledge and skills in trauma reception and resuscitation by the emergency and trauma doctors in Myanmar.

Central to the program was the delivery of trauma care team training to Myanmar clinicians in Myanmar, Thailand and Australia. The Alfred delivered the Trauma Team Training (TTT) program at Yangon General Hospital each year for three years, conducted over three weeks annually, with a faculty of four doctors and four nurses (all trauma specialists). More than 72 doctors and nurses were trained.

In 2017 the TTT program was delivered alongside the Myanmar faculty; following this, the course is now entirely delivered by the Myanmar faculty. The Alfred also delivered the Masterclass in Advanced Surgical Techniques in Trauma (MASTT) program. In the first year, the faculty of 4 surgeons and 2 operating theatre nurses visited the Yangon General Hospital and worked alongside local staff.

In Year 2, the faculty collaborated with Thai surgeons to deliver the one week masterclass using the cadaver lab at Chiang Mai University, Thailand. In Year 3, the course was delivered alongside the new Myanmar faculty as the first international course conducted at a cadaver lab in Myanmar.

By its completion, the Australia-Myanmar has assisted Myanmar by introducing a trauma management program that improved the reception and resuscitation of a severely injured person at hospital arrival.

This in turn improved outcomes from injury - as well as disaster response and management, education cooperation and the emerging regional health issue of injury management. Following the successful delivery of this program the death rate from road traffic accidents treated at Yangon General Hospital fell by 30% (p=0.031).

In 2018, as part of this program, the Myanmar National Trauma Plan was written as a road-map for Myanmar to develop a fit for purpose trauma system taking into account governance, financing, data and quality improvement, and capacity and infrastructure. The Myanmar National Trauma Plan was created, in partnership with WHO and AO Alliance Foundation. The plan is on the Minister's desk, awaiting review, before final completion.

SAUDI ARABIA

PROJECT:	The King Saud Medical City-The Alfred International Trauma Program
KEY PERSONNEL:	Mark Fitzgerald, Biswadev Mitra, Peter Cameron, Mike Noonan, Dina Farjou, Kim Williams
PARTNERS:	NTRI, Monash University, Saudi Arabian Ministry of Health, Saudi Red Crescent Authority
DURATION:	Commenced: 2016 | Expected Completion: 2020

Trauma is the leading cause of death in the first four decades of life and the second most frequent cause of death in all age groups in The Kingdom of Saudi Arabia. Trauma is also the leading cause of disability of young and productive members of Saudi society. The incidence of major trauma and associated fatalities in Saudi Arabia has increased over recent years with population growth, increased vehicle ownership and the rapid development of highway infrastructure.

King Saud Medical City is a Ministry of Health (MOH) tertiary hospital with 1,400 bed capacity based in Riyadh, KSA. It is staffed with 8,000 employees. KSMC has three major hospitals: General Hospital, Pediatrics and Maternity Hospitals and is undergoing a major rebuilding and expansions program.

In 2016, responding to the increasing trauma burden, King Saud Medical City entered into Memorandum of Understanding (MOU) The Alfred and NTRI to assist in the establishment of a Level I Trauma Center, to provide the clinical, technical and technological training, and education to its medical team. With the overall goal to establish KSMC as a national hub for trauma management, education and training, trauma research and in-hospital trauma registry, with KSMC eventually becoming the focus for the establishment of The Kingdom of Saudi Arabia Trauma System and a regional hub within the Gulf and the Middle East.

Official re-enactment of signing of agreement between Project Directors from KSMC and The Alfred at the Saudi Arabian MOH symbolised the official endorsement of the project and its intended outcomes by the MOH; March 2017 scoping visit.

The program commenced late in 2016 following the signing of the Service Collaboration Agreement. The program objectives are divided into the following sub-projects:

- Trauma reception & resuscitation training
- Introduction of a localised version of the Trauma Reception and Resuscitation (TR&R©) decision support software system
- Trauma services development
- Advanced trauma training
- In-hospital trauma registry development
- Establishment of a Trauma Research Institute.

TRR© TRAINING PROGRAM

The Alfred/NTRI Trauma Reception and Resuscitation training program delivery, to KSMC nurses and physicians commenced in 2017, and was undertaken at KSMC to the end of 2018.

Some of these candidates have also undertaken observerships in the Alfred Emergency Department, Trauma Unit and Trauma Ward (2) West.

TRR© DECISION SUPPORT SOFTWARE

In 2017 the Alfred team The Alfred Team tailored the usability and functionality of the TR&R® System based on KSMC's needs; the reference data and algorithms have been adjusted to focus on Life Saving Interventions.

In 2017 the Alfred/NTRI Trauma Reception and Resuscitation training program was delivered to a total of 48 KSMC nurses and physicians with some of these candidates also undertaking observerships in the Alfred ED, Trauma Unit and Ward 2 West. By the end of December 2017 the course over to the KSMC for them to administer and run in December 2017.

TRAUMA REGISTRY

One of the first subprojects to commence was the development of the KSMC in-hospital trauma registry. After a registry scoping visit in April, the 79 item KSMC trauma registry minimum trauma dataset was developed. In August, the Trauma Registry Training Program was delivered to newly designated trauma nurse coordinators at KSMC. The Saudi Trauma Registry (STAR) commenced data collection in August 2017, supported by real-time registry monitoring and a quality assurance visit in October.

By the end of 2018 in-hospital trauma data was collected from 3662 KSMC trauma patients. Construction of the bespoke database was completed in March 2018 with go live in April 2018, at which time the registry became fully operational.

ADVANCED TRAUMA TRAINING

Since the program commenced a variety of advanced programs and activities have been delivered at The Alfred to KSMC staff and also delivered on site at KSMC. These include training sessions on chest trauma management, traumatic brain injury, and the sharing of relevant nursing leadership models and resources.

Virtual joint trauma grand rounds (TGR) have been regularly conducted by KSMC and attended by the Alfred/NTRI team in 2017 and 2018. In addition, KSMC staff also attended the streamed Victorian Trauma Grand Rounds in 2017 and 2018.

Live-streaming of 2nd joint TGR with Alfred Team at KSMC (December 2017)

TRAUMA SERVICES DEVELOPMENT

Following the first scoping visit by The Alfred Team to KSMC in March 2017, key recommendations were made for the services/departments associated with the multi-trauma patient journey at KSMC. Subsequently Professor Mark Fitzgerald undertook a review of the planned Emergency Department design for KSMC's new ED facility (anticipated to open in 2019) and made some key recommendations for further enhancing this design. In December 2017, Professor Mark Fitzgerald and the visiting The Alfred team conducted a follow-up visit to ensure accurate implementation.

Plans for KSMC to get RACS Trauma Verification were commenced in 2017. In 2018, as part of this process Ms Clare Stewart, Trauma Nurse Consultant joined the team at The Alfred to support The Alfred and KSMC with the Level 1 Trauma Center verification process by RACS. In November 2018 RACS Trauma Verification was undertaken at the Alfred observed by key KSMC program members, with a view to KSMC undertaking verification in 2019.

RESEARCH INSTITUTE

The aim of this component of the KSMC project is to establish the KSMC Trauma Research Institute that will link with the KSMC trauma service; utilise the KSMC Trauma Registry data; develop research projects; and encourage opportunities for collaborative research. The project commenced with scoping visits in April 2017 and then the delivery of the Research Methods Workshop at KSMC in October 2017.

In 2018 this work continued with the delivery of a further Research Methods Workshop and the identification and development of several research projects.

In 2018, the KSMC Trauma Research Institute produced its first publication, Alshareef, H., Al Saawi, A., Almazroua, F., Alyami, H., Reilly, G.O., Mitra, B. Localisation of the cricothyroid membrane by digital palpation in the emergency department (2018) Postgraduate Medical Journal, Article in Press.

TRAUMA REGISTRIES

ALFRED HEALTH TRAUMA REGISTRY

LEAD INVESTIGATORS: Mark Fitzgerald and Joseph Mathew

KEY PERSONNEL: Louise Niggemeyer, Zoe Cheung, John Dyer, Laura McEntaggart

The Alfred Hospital Trauma Registry (AHTR) is a trauma epidemiology, injury surveillance and performance monitoring program that is pivotal to the monitoring of the Victorian State Trauma System (VSTS) and the Alfred Health Trauma Service.

The registry consists of over 200 data items and has been operating at The Alfred since 2001. Its aims are to provide the Alfred Health Trauma Service with high quality, reproducible, accessible data for performance management and research purposes.

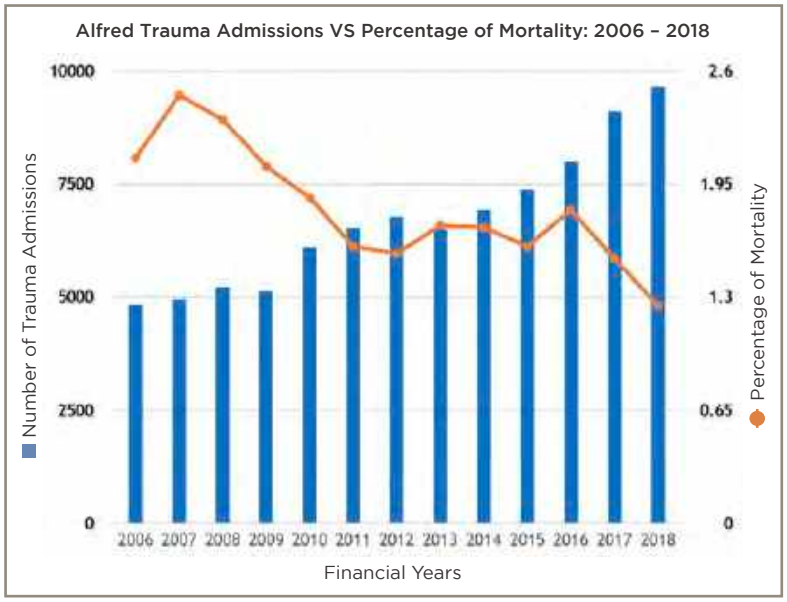
The VSTS was established in 2000 in response to the 1999 RoTES report with the overall aim to reduce trauma mortality and morbidity by enhancing trauma patient management – "getting the right patient to the right hospital in the shortest time" Data from the AHTR demonstrates that the VSTS is working with an increase in major trauma in patients admitted to The Alfred Hospital.

In addition, the AHTR provides clinical quality data for research projects, within Alfred Health and across Australia, that continue to inform practice and care, practice and care of injured patients.

OBJECTIVES:

Contribute clinical quality registry data to the Alfred Health Information Grid that links to other relevant datasets creating a patient level unified trauma dataset.

- Monitor trauma care and business related processes at The Alfred.
- Assist with monitoring trauma care in Victoria by generating datasets for the Victorian State Trauma Registry.
- Assist with monitoring trauma care nationally by generating datasets for the Australian Trauma the Australian Trauma Registry.
- Implement The Alfred Trauma Quality Care Program.
- Assist with trauma research, education, knowledge translation and publication.



AUSTRALIA–INDIA TRAUMA SYSTEMS COLLABORATION TRAUMA REGISTRY

PROJECT: Australia-India Trauma Systems Collaboration (AITSC)

KEY PERSONNEL: Gerard O'Reilly, Joseph Mathew, Teresa Howard, Amit Gupta, Nobhojit Roy and Vineet Kumar.

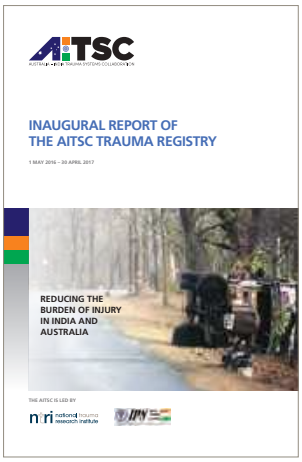
PARTNERS: JPN Apex Trauma Center All India Institute of Medical Sciences (AIIMS), New Delhi; Guru Teg Bahadur Hospital, New Delhi; Lokmanya Tilak Municipal General Hospital, Sion, Mumbai; Sheth Vadilal Sarabhai General Hospital, Ahmedabad.

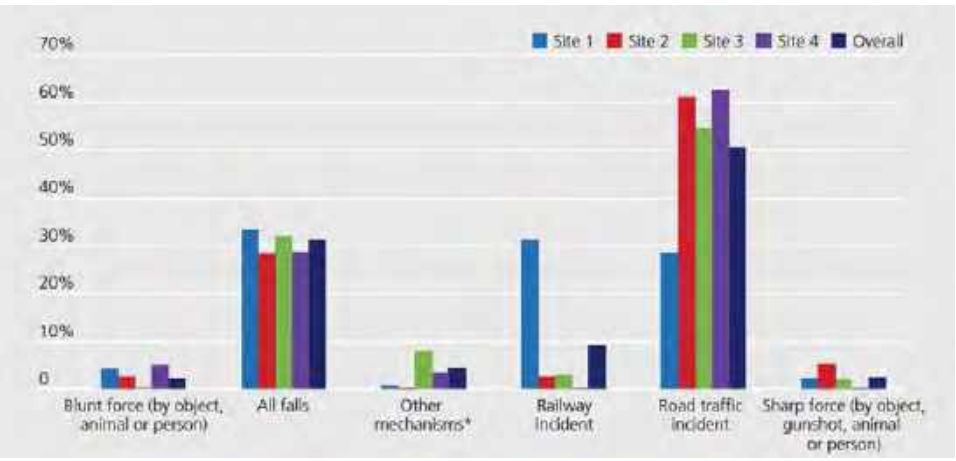
Globally, over 5 million people die each year following injury. More than one death in every ten occurs in India, where tragedy on the roads and in workplaces is increasing. Many survivors are disabled by their injuries, and like Australia, more productive years of life are lost following injury than any other cause. The AITSC registry was developed to allow rigorous measurement of the four key interventions of the collaboration and provide a snapshot of in-hospital trauma care in four large multi-disciplinary hospitals, from three states, in India.

The AITSC registry collected data from patients who presented to the trauma hospitals with a potentially life-threatening or limb-threatening injury who were either admitted to hospital or died after triage but before admission. The registry consists of 81 data items, that can be divided into core and intervention items, with data extracted from hand written patient records by trained data collectors. The core data items were mapped and contributed to the World Health Organisation draft minimum trauma dataset, being developed at the time of the AITSC project.

The Inaugural Report of the AITSC Trauma Registry was presented to the Indian Government in March 2018 at the AITSC Wrap Up Symposium – the first time a multi-site in-hospital trauma care registry report has been produced in India. For each site, it identified areas of trauma care that required attention and improvement, and gave the first consolidated glimpse of how their care compared to another site in India.

At the end of the project collection of the AITSC data items did not continue, although each site continue to collect trauma data for their own purposes. Each of the AITSC continue to collect in-hospital trauma care data. The AITSC registry and registry report is currently being used to highlight the need for in-hospital trauma registries across India, we expect the Indian Government to prioritise the development of a national in-hospital trauma registry based on the AITSC core data items. In addition, the NTRI are using the AITSC core data items as the basis for trauma registries being developed in Saudi Arabia and China.





AUSTRALIA NEW ZEALAND TRAUMA REGISTRY

LEAD INVESTIGATORS: Mark Fitzgerald and Kate Curtis

PARTNERS: Visit www.atr.org.au under 'Contributing Sites' for full list.

FUNDING: The ATR is only possible because of the commitment and dedication of the people working in the collaborating sites, the sites themselves, and the to the support of the Commonwealth Government, Royal Australasian College of Surgeons, The Australasian Trauma Society, The Australian Automobile Association.

Operating since 2012, the Australian Trauma Registry (ATR) is a key component of the Australian Trauma Quality Improvement Program (AusTQIP). It provides an annual report as the basis for understanding the burden and patterns of severe injury in Australia.

AusTQIP was established in 2011 by the National Trauma Research Institute, with funding from the National Critical Care and Trauma Response Centre (NCCTRC) and Alfred Health. It is a collaboration between all Australian designated major trauma centres and established state and hospital-based trauma registries. The AusTQIP Collaboration is currently a collaboration of 26 major trauma centres across Australia whose mission is to improve survival, enhance the quality of trauma care, and optimise recovery by shared data and shared knowledge.

The ATR focuses on monitoring trauma care, from the time of incident to discharge from definitive care. Collecting and analysing information about trauma patients, their management and their injury outcomes informs future improvements to health service provision and development, with the long term societal aim of reducing preventable deaths and permanent disability as a result of injuries. The ATR collects 67 data-points in accordance with the bi-national Trauma Minimum Dataset for Australia and New Zealand, for severely injured patients (ISS > 12) or death after injury. The major trauma centres submit data to the ATR directly or through state-based registries.

The NTRI leads and coordinates the AusTQIP Collaboration and maintains the ATR with its partner Monash University, Department of Epidemiology and Preventive Medicine. Monash, a leader in registry development and operation, manages the ATR database and prepares the reports, and is the point of contact for all data related enquiries.

In 2018, AusTQIP presented two ATR reports for the years 2015/16 and 2016/17. The ATR also became the Australia New Zealand Trauma Registry, with the signing of an MOU with the Accident Compensation Corporation (New Zealand Trauma Registry Collaboration), resulting in a redesign of the ATR and AusTQIP logos.

31 MAJOR TRAUMA CENTRES

65,000+ PATIENTS

67 DATA POINTS

SAUDI TRAUMA REGISTRY — STAR

PROJECT: The King Saud Medical City-The Alfred International Trauma Program

KEY PERSONNEL: Mark Fitzgerald, Jane Ford, Abdulrahman Saad Alqahtani, Shatha Abdul Aziz Abuzinda and Peter Cameron.

The Kingdom of Saudi Arabia is the largest Arab country in the Middle East with approximately 32.4 million people. Injury is the leading cause of premature death. Responding to this growing burden of injury, particularly road trauma, the Kingdom of Saudi Arabia engaged the Alfred Hospital, through the NTRI, to assist the King Saud Medical City (KSMC) to establish a Level One Trauma Service. The establishment of the Saudi Arabian Ministry of Health Trauma Registry at King Saud Medical City is a component of this program. Its development utilises the expertise from the Alfred Hospital Trauma Registry, the Australia-India Trauma Systems Registry and the Victorian State Trauma Registry at Monash University.

The KSMC Trauma Registry, also called the Saudi Trauma Registry (STAR), collects data from all patients whose reason for admission is traumatic injury and who either die as a result of injury or whose length of stay in hospital is three or more days. At this time Minimum Dataset (MDS) consists of over 70 data items that capture the injury event; pre-hospital care; injury diagnoses; procedures performed and the definitive care that is given at the KSMC, including the outcome of the admission.

The IT department at KSMC developed a database with a user interface that accepts direct entry of the data and has a functional reporting menu. Data collectors at KSMC were trained in registry science, methodology and data management, and introduced to Abbreviated Injury Scale coding. After a period of development and training, data collection commenced in August 2017.

In the first year of collection, from August 2017 to July 2018, a total of 2100 complete data records were entered into the STAR database. The inaugural STAR report for that 12 month period was presented at the Saudi Trauma Conference in February 2019. In the full 2018 calendar year, 2520 cases were entered into the database. Ongoing annual reports in calendar years are planned.

The data is being used operationally as process indicators and for monitoring of KSMC systems. It is also available for use by researchers who wish to study aspects of trauma care in the Kingdom. All use of the data is governed by an access policy that protects patient confidentiality and ensures oversight by the STAR Steering Committee.

EDUCATION

EDUCATION

The NTRI offers a number of educational programs that range from two-hour in-service courses to an 18 month Masters of Clinical Medicine (Trauma) offered in partnership with Monash University.

The trauma education courses are managed by either the Department of Epidemiology and Preventative Medicine (DEPM), Monash University, or directly by the NTRI.

These programs are delivered locally, nationally, and internationally as part of the NTRIs international trauma systems development programs.

THE PROCEDURES COURSE

FACULTY: Mark Fitzgerald, Joseph Mathew, Chris Groombridge, Amit Maini, Mike Noonan, and Francis O'Keefe.

LOCATION: Melbourne University Anatomy Lab, Melbourne, Australia

DURATION: 2 Day Course

WEBSITE: https://theproceduresscourse.com

The Procedures Course, developed by A/Professor Joseph Mathew, is a 2-day course that teaches clinicians how to confidently perform a wide range of basic and complex resuscitative procedures. It is a collaboration between The Alfred Emergency Department, The Alfred Trauma Unit, The National Trauma Research Institute, and Monash University.

The sessions have a heavy emphasis on acquiring hands-on skills for the management of the multiply injured complex trauma patient. It comprises phase 1 of the Alfred Shock, Trauma & Resuscitation Program (A-S.T.A.R) which focuses primarily on procedural skills.

PROCEDURES COVERED:

- Surgical airway (cricothyroidotomy)
- Orbital decompression (lateral canthotomy and cantholysis)
- Pleural decompression (finger thoracotomy and pleural drainage)
- Vascular access (MAC line / RIC line / Intraosseous access)
- Temporary trans-venous cardiac pacing
- Pericardial decompression
- Resuscitative thoracotomy
- Scene limb amputation
- Escharotomy
- Resuscitative hysterotomy

The course is held at the Melbourne University Anatomy Lab, state of the art labs and classrooms for procedural teaching on fresh, unembalmed, donor cadavers.

The **Trauma Procedures Course** has established a national reputation for the quality of the program design and delivery. Accredited by The Australasian College for Emergency Medicine, the program is offered to external health professionals by The Alfred and Critical Care physicians from across Australian have attended courses hosted in Melbourne. The course feedback has been consistently outstanding.

The first international course was conducted in Guangzhou, China, in October 2017. In 2018, the Procedures Course was also held in Brisbane and Adelaide, and will be held in Sydney in 2019.

TRAUMA SKILLS COURSE

FACULTY: Mike Noonan, Mark Fitzgerald, Joseph Mathew, Cecil Johnny, Kate Martin

LOCATION: The Alfred Hospital (Trauma Service), Melbourne, Australia

DURATION: 5 hours: Contact | 6 hours: Online pre-learning package

CONTACT: je.bradford@alfred.org.au

The Alfred Trauma Skills Course (TSC) aims to improve the quality of trauma patient care through the standardisation and delivery of foundation trauma skills training to medical practitioners. It's target audience is medical practitioners involved in the care of multi-trauma patients.

The TSC program is run every 3 months at The Alfred, and can be adapted for delivery internationally.

PROGRAM AIMS:

- To promote cross-speciality collaboration and teamwork between medical staff who manage multi-trauma patients through joint education.
- To provide a quality framework in the management of multi-trauma patients through the delivery of standardised procedural skills education to medical staff managing this patient cohort.

On completion of the course, participants will have acquired further knowledge and skills in the following:

- Trauma Primary, Secondary and Tertiary Assessments
- Splinting techniques (including pelvic binder application and long bone splinting)
- Haemorrhage control techniques (including haemostatic sutures and tourniquet application)
- Large bore vascular access techniques (including Rapid Infusion Catheter (RIC) and Multi-lumen Access Catheter (MAC) insertion)
- Surgical Safety, Tissue handling and wound closure techniques (including personal protection for surgical techniques, sterile field preparation and minor surgical technique)
- Pleural decompression and chest tube insertion

WOUND MANAGEMENT COURSE

FACULTY: Mark Fitzgerald and Cecil Johnny

LOCATION: Skills Lab, Australian Centre for Health Innovation, Melbourne, Australia

DURATION: 1.5 hours: Contact | 15 minutes: Online pre-learning materials

CONTACT: kim.williams@alfred.org.au

The Wound Management Course, designed by Dr Cecil Johnny, is an in-service session for HMOs and Junior Interns in emergency and trauma.

The program involves an introductory presentation followed by hands-on skills stations to prepare learners to:

- Gain required patient / family consent
- Appropriately scrub up
- Prepare and maintain a sterile surgical field
- Demonstrate two primary wound closures

ALFRED TRAUMA SERVICE OBSERVERSHIP

FACULTY: Joseph Mathew

LOCATION: Alfred Trauma Service, The Alfred, Melbourne

DURATION: 3 months – 1 year

CONTACT: joseph.mathew@monash.edu

The Medical Observership Program offers participants a unique shadowing experience at The Alfred's Trauma Service and within other specialty units as required. Candidates who are accepted into this program will attend The Alfred Hospital to observe the advanced management of trauma patients at a world class Level One Trauma Centre.

FELLOWSHIP IN TRAUMA MEDICINE

FACULTY:	Mark Fitzgerald, Joseph Mathew, Meei Yeung, Kate Martin, Helen Stergiou, Mike Noonan, Marc Schnekenburger, Cecil Johnny, Chris Groombridge, Simon Hendel, Danny Ben-Eli, and Gim Tan
LOCATION:	The Alfred Hospital, Melbourne, Australia and affiliate hospitals within the Victorian State Trauma System.
DURATION:	12 months – full-time equivalent
CONTACT:	k.williams@alfred.org.au

The Fellowship in Trauma Medicine program is a comprehensive formal 12 month program with both clinical (75%) and non-clinical (25%) related objectives.

They allow candidates to gain advanced knowledge and skills in the advanced management of trauma patients at a world-class Level 1 Trauma Centre.

There is also an opportunity to complete a Master of Clinical Medicine (Trauma), in conjunction with Monash University.

OBJECTIVES:

- Summarise current 'best practice' in the acute management of the Multi-Trauma Patient.
- Compare and Contrast the roles of the Medical Specialities involved in the care of the Multi-Trauma Patient.
- Illustrate the importance of integrated Specialty care in the Management of the Multi-Trauma Patient.
- Demonstrate clinical expertise in both the clinical skills and clinical decision making required to care for the Multi-Trauma Patient.
- Demonstrate clinical leadership in the Management of the Multi-Trauma Patient.
- Demonstrate leadership in Quality Improvement (QI), Research and/or Education as they pertain to the Management of the Multi-Trauma Patient.

MASTERS OF CLINICAL MEDICINE (TRAUMA), MONASH UNIVERSITY

FACULTY:	Mark Fitzgerald, Joseph Mathew
LOCATION:	The Alfred Hospital, Melbourne, Australia
DURATION:	12 months – full-time / 24 months – part-time
WEBSITE:	www.monash.edu.au/pubs/handbooks/courses/M6023.html

The course, located at The Alfred hospital, will equip experienced health care practitioners with the knowledge and skills to meet the challenges that beset the modern health care system. It will provide them with an academic framework within which to develop a range of advanced problem-solving and decision-making skills to achieve best practice health outcomes for patients and clients.

The trauma specialisation is designed for experienced medical practitioners/clinicians seeking a globally recognised specialist post-graduate qualification in trauma medicine. The specialisation prepares graduates for senior clinical and operational leadership roles in the management of trauma. Graduates complete academic coursework at Monash University and supplement this with a clinical specialisation offered by The Alfred Hospital Emergency and Trauma Centre and The Alfred Hospital Trauma Service.

The specialist units explore the importance of and provide skills in: the practice of evidence-based medicine, undertaking trauma research, trauma leadership and system/service development, and the development of advanced specialised clinical skills. Graduates are provided a unique opportunity to undertake a clinical placement in a major modern metropolitan emergency department with a level one trauma centre. It can be taken in conjunction with a Fellowship in Trauma Medicine.

The course outcomes are aligned with the Australian Qualifications Framework level 9 and Monash Graduate Attributes.

VICTORIAN GRAND TRAUMA ROUND

COLLABORATORS: The Alfred, Royal Melbourne Hospital and Royal Childrens Hospital

DURATION: 3 hours – Quarterly

WEBSITE: www.vtgr.org

The Victorian Trauma Grand Round (VTGR) is a collaborative initiative to provide a forum for healthcare professionals involved in acute trauma care in Victoria to explore and debate all aspects of trauma management. The program promotes collaborative efforts and networking among members of the trauma community and showcase the expertise and available resources in trauma care in Victoria. Each quarter a grand round event is hosted by a major Victorian trauma care provider. These events are open to all healthcare professionals.

The VTGR is a collaboration between:

1. Alfred Health via the National Trauma Research Institute and Emergency & Trauma Centre.
2. Ambulance Victoria (inclusive of Adult Retrieval Victoria).
3. Melbourne Health via the Royal Melbourne Hospital Trauma Service and Emergency Department.
4. The Royal Children's Hospital Trauma Service, Emergency Department and Pediatric Infant Perinatal Emergency Retrieval Service (PIPER).

The inaugural Victorian Trauma Grand Round was held on June 27th 2017 at The Alfred Hospital and was attended by the Victorian Minister for Health Jill Hennessy. It was also broadcast live to healthcare professionals across Australia and worldwide, including to Fiji, Hong Kong, Singapore, United Arab Emirates, Saudi Arabia, United Kingdom, Ireland, Finland, China, Qatar and India.

The Alfred's Director of Trauma Service, Professor Mark Fitzgerald, led the event and said bringing together the Victorian trauma community in this way has been the result of many years of discussions. More than 300 healthcare professionals were present on the night, with attendees made up of medical professionals, allied health practitioners, paramedics and health students.

Since then the VTGRs, alternating between the four collaborating sites, have become a fixture within the trauma community in Victoria. Attendance at the VTGRs are usually in excess of 400, with over 200 streaming registrations from metropolitan and rural Victoria, as well as people in; Argentina, Canada, Costa Rica, France, Germany, Italy, India, Japan, Laos, New Zealand, Saudi Arabia, United Kingdom, United States and Vanuatu.

TRAUMA TEAM TRAINING

FACULTY: Mark Fitzgerald, Joseph Mathew, Helen Stergiou, Ellaine Boo, Emma Lim

LOCATION: Local / National / International

DURATION: 8 hours

CONTACT: ch.lim@alfred.org.au

The introduction of the Victorian State Trauma System in 2000 saved many Victorian lives, and reduced the disability from trauma significantly. In Victoria, meeting the education and training needs of health professionals was identified as one of the key priorities in the five-year strategic framework for the continuing development of the VSTS.

The initial assessment and treatment of critically injured patients is time sensitive, and often the key variable in the success of treatment and reduction in morbidity. The Trauma Team Training program was developed with funds from the Transport Accident Commission (2017 – 2020), to provide a consistent approach across the State of Victoria for trauma reception and resuscitation (TRR) management within trauma teams, and deliver the program to trauma teams across Victoria.

In 2019 and 2020 the Trauma Team Training program will be delivered 24 programs, and four train-the-trainer programs, to trauma teams throughout Victoria. It will also deliver localised versions overseas in China, Saudi Arabia and India.

The training program aims to:

- Provide a quality framework in the management of multi-trauma patients through the delivery of standardised reception and resuscitation process.
- Improve cross-speciality collaboration and interaction between those who manage multi-trauma patients.

TRAUMA AWARENESS AND PREVENTION

PREVENT ALCOHOL AND RISK-RELATED TRAUMA IN YOUTH (P.A.R.T.Y) PROGRAM

FACULTY: Anna Gunn and Hayley Ball

FUNDING: Victorian Department of Health and Human Services, AAMI

CONTACT: anna.gunn@partyalfred.com.au | hayley.ball@partyalfred.com.au

WEBSITE: www.partyalfred.org

BACKGROUND:

The Prevent Alcohol and Risk-Related Trauma in Youth (P.A.R.T.Y.) program is a dynamic and interactive injury awareness and health promotion program that uses clinical reality to show participants the consequences that can occur when engaging in risk-taking behaviour. P.A.R.T.Y. aims to provide participants with information that will enable them to recognise potential injury-producing situations; make prevention-oriented choices; and adopt behaviours that minimise unnecessary risk. P.A.R.T.Y. participants engage with emergency service professionals; paramedics, doctors, nurses, allied health practitioners, and people who have experienced trauma and survived – often with significant disabilities.

The P.A.R.T.Y. program has been running at The Alfred since 2009 as an initiative of the NTRI, and was developed and licensed from the parent P.A.R.T.Y. program at Sunnybrook Health Sciences Centre, Toronto, Canada (www.partyprogram.com). P.A.R.T.Y. at The Alfred is supported by funding from the Victorian Department of Health and Human Services (DHHS), AAMI and in-kind support from The Alfred.

EVOLUTION:

P.A.R.T.Y. at The Alfred initially ran as a single day, in-hospital model delivered to senior school students. The program then adapted content and expanded its delivery models to target different cohorts of participants and achieve greater reach within the population of Victoria.

Outreach Program - Horsham

Volunteer Assist Students

MODELS AND POPULATIONS:

In-Hospital Program

The In-hospital program is a full-day program and sees participants follow the journey of a trauma patient from pre-hospital to rehabilitation. The In-hospital programs are delivered to the following populations:

- Senior school students (including a program for family and friends of Alfred Health)
- Royal Australian Navy (RAN) trainees (Defence In-hospital)
- Organisational Apprentices

School selection occurs through a randomised, stratified online ballot system. Metropolitan and regional schools, government and independent/Catholic attend the In-hospital program.

P.A.R.T.Y. Outreach

The Outreach program is an off-site, full day program, adapted from the In-hospital model. P.A.R.T.Y. Outreach transforms regional performing arts centres to replicate working hospital settings, and has been a successful initiative that extends the reach of the program within regional Victoria.

Over the course of 2016 to 2018, P.A.R.T.Y. at The Alfred visited Warrnambool, Wangaratta, Bendigo, Mildura, Shepparton, Traralgon and Horsham, with 2142 regional senior school students attending the programs (over 3,000 since its inception in 2012). Outreach schools (government and independent/Catholic) within a 100km radius of the venue are invited to attend the program.

P.A.R.T.Y. at The Alfred has delivered an adapted Outreach model to Royal Australian Naval (RAN) trainees at HMAS Cerberus (Defence On-Board).

P.A.R.T.Y. STAFF:

The P.A.R.T.Y. at The Alfred program team is made up of a senior coordinator, coordinator and project officer. The wider P.A.R.T.Y. team includes Alfred emergency physicians, nurses and allied health professionals.

The team is well supported by Alfred Health volunteers who assist with administration and program day duties for both In-hospital and Outreach programs. A new staffing model is to be developed to direct more focus on research and innovation of P.A.R.T.Y. in 2019.

PROGRAM STATISTICS:

Program Model	Program Days Delivered	Participant Numbers
In–hospital: School	48	1310
Outreach	24	2142
RAN: In–hospital / On-board	14	379
Apprentice	4	151
TOTAL	**90**	**3982**

PREVENT ALCOHOL AND RISK-RELATED TRAUMA IN YOUTH (P.A.R.T.Y) PROGRAM

ACHIEVEMENTS:

- An increase in participant numbers attending the program over the course of 2016 to 2018, with the 2018 calendar year seeing more participants attend all models of P.A.R.T.Y. at The Alfred in program than in the program's history.
- The program's content was reviewed and updated to better align with the school curriculum, and create more meaningful and consistent learning for participants.
- An ongoing partnership with the RAN and apprentice group, Cummins has been developed.
- In 2017, P.A.R.T.Y. at The Alfred received an additional two years of funding from the DHHS for continued delivery of the Outreach program until June 30th 2019.
- The first P.A.R.T.Y. at The Alfred paper looking the effectiveness of the program for school students was published.

OUTPUTS:

P.A.R.T.Y. at The Alfred is increasing its presence in the research space. P.A.R.T.Y. research initiatives have measured the effectiveness of In-hospital and On-board P.A.R.T.Y. programs on reducing alcohol-related harms in the Royal Australian naval trainees (see page 13 for further information); and the effect of the P.A.R.T.Y. program among senior school students. The paper with the same title was presented at Trauma 2017 and was published in Emergency Medicine Australasia in 2018.

P.A.R.T.Y. at The Alfred had an academic poster presented at the International Conference on Emergency Medicine (ICEM) 2018 Conference, Mexico, which looked at the efficacy of P.A.R.T.Y. program delivery model for regional participants – Outreach verses In-hospital.

FUTURE DEVELOPMENTS:

Since inception and through its multiple models, P.A.R.T.Y. at The Alfred has delivered the program to in excess of 9000 participants (including the now defunct Young Offenders program, which continues to run from the Royal Melbourne Hospital). P.A.R.T.Y. at The Alfred has a strong commitment to utilising new and innovative methods of content delivery to expand the program, and in the future, aims to:

- Improve promotion of P.A.R.T.Y. at The Alfred in the technological space
- Move to paperless / tech-based solutions to make the high level of current program administration redundant
- Develop innovative technologies to better meet the public need/demand.
- Develop new research opportunities to increase output.
- Increase its quality and output of research and continue to align research with its programs to ensure that the content and delivery are evidence-based.
- Seek targeted funding to develop and deliver additional P.A.R.T.Y. models to better meet public need/demand.
- Strengthen relationships between P.A.R.T.Y. sites to ensure; consistency between programs, research development between sites, shared innovation opportunities for P.A.R.T.Y.
- Strengthen their partnership with the RAN and to expand across all facets of the defence force.
- Look at expansion within regional Victoria, through the development of shared initiatives such as hospital multisite delivery models.

P.A.R.T.Y. at The Alfred shares a common goal with all P.A.R.T.Y. sites and trauma systems throughout Australia, to reduce the impact of trauma and burden of injury on society.

NTRI GOLD COAST


ABCD
AIN ENTRY
GOLD COAST UNIVERSITY HOSPITAL
Emergency
P
Parking
Block E
Pathology &
Education
Blocks
Main

GOLD COAST UNIVERSITY HOSPITAL

Gold Coast University Hospital (abbreviated GCUH) is a major health facility offering tertiary level health care for the Gold Coast, Queensland that was completed in September 2013. As one of Queensland's largest clinical teaching and research facilities, GCUH is a 750 bed hospital with the busiest emergency department on Queensland. The trauma service is led by Professor Martin Wullschleger (Head) and Dr Don Campbell (Deputy Head). In 2017, GCUH underwent Royal Australian College of Surgeons Trauma Verification, and were subsequently awarded Level 1 trauma centre status in 2018.

Gold Coast's Trauma Service developed their first research strategy in 2014. They identified six key core research pillars and created an action plan to move this strategy forward. In the five years, since that strategy was initiated, the research culture of the team has grown substantially. Every member of the team, from consultants to nurses to data managers, participate in research and also actively recruit patients.

Since 2015, the number of abstracts submitted to conferences has grown from <5 to nearly 50 in 2018. Conference presentations and poster presentations have increased too – with >25 oral presentations and 30 poster presentations in 2018. More research is making it to publication too – 1 publication in 2015 increased to 4 in 2018. Two HDR students started their studies in 2018.

GCUH Trauma Service are currently leading two multi-centre randomised controlled trials of fibrinogen early in severe trauma (FEISTY and FEISTY Junior) with a FEISTY II planned in the future, and is also looking at projects in enhanced nutrition in trauma, and the analysis of watersport and marine injuries, incidence of PTSD and 6 and 12-month follow of severely injured patients.

On the 1st January 2018, The Gold Coast University Hospital and Health Service became the second National Trauma Research Institute Site in Australia, after the signing of a Memorandum of Understanding.

The parties agreed to establish a collaborative relationship promoting national trauma prevention, control and management focusing on, but not limited to the following areas:

- Trauma registry and data sharing
- Trauma care
- Trauma education
- Trauma quality improvement
- Joint trauma research applications
- Participation in NTRI international

In August 2018 staff from the NTRI Gold Coast met with the NTRI Melbourne to discuss the collaboration and set an agenda for activities. To date, the NTRI Melbourne/Gold Coast activity has mostly been related to the Australian Trauma Registry (ATR), with Mr Ben Gardiner and Dr Teresa Howard working on the re-branding of the ATR, development of the new ATR website, hosting a booth at Trauma 2018, and on the delivery of the Trauma 2018 Nursing Quality Improvement and Data Management Forum workshop, held in October 2018.

As part of the MOU activities Professor Wullschleger and Kate Dale (Nurse Practitioner / Trauma Program Manager) were also invited as a speakers and part of the faculty of the King Saud Medical City Research Conference being held in February 2019.

The next step is to develop a collaborative research program with the NTRI and working together in future research applications.

FIBRINOGEN EARLY IN SEVERE TRAUMA STUDY (FEISTY)

LEAD INVESTIGATORS:	James Winearls, Don Campbell, Martin Wullschleger
KEY PERSONNEL:	Elizabeth Wake, Kerin Walters, Sarah Czuchwicki
COLLABORATORS:	Gold Coast University Hospital (Lead), Princess Alexandra Hospital, Royal Brisbane Women's Hospital, the Townsville Hospital
FUNDING:	Emergency Medicine Foundation | National Blood Authority - $172,977.00
DURATION:	Commenced: December 2017 | Completion: 2019

Trauma is the leading cause of death worldwide in individual's aged 18-39 with data from the WHO suggesting that worldwide almost 6 million deaths every year are directly attributable to trauma. Despite advances in trauma management, a significant proportion of these deaths are still due to haemorrhage. Death can occur early as a result of uncontrollable haemorrhage; in patients where surgical haemorrhage control is achieved subsequent morbidity and mortality can be attributed to effects of massive haemorrhage and large volume blood product transfusion.

Trauma Induced Coagulopathy (TIC) is a complex coagulopathy associated with severe trauma. Hypofibrinogenaemia plays an important role in TIC. Fibrinogen is an important blood clotting protein that helps form stable blood clots to stop bleeding. Fibrinogen levels fall very quickly in severe traumatic haemorrhage and it is postulated that early replacement of fibrinogen may improve outcomes.

The majority of trauma centres in Australia utilise cryoprecipitate for additional fibrinogen supplementation as part of a Massive Transfusion protocol. There is an increasing use of early Fibrinogen Concentrate in severe bleeding but this is not supported by high level evidence.

There are currently no previous published studies comparing a targeted dose of Fibrinogen Concentrate and Cryoprecipitate in bleeding trauma patients. This pilot multi-centre randomised controlled trial will compare Fibrinogen Concentrate to Cryoprecipitate for fibrinogen replacement in severely injured trauma patients. The FEISTY study will be performed at 4 major trauma centres in Queensland, Australia.

Recruitment: 100/100

INVESTIGATING FIBRINOGEN IN SEVERE PAEDIATRIC TRAUMA (FEISTY JUNIOR)

LEAD INVESTIGATORS: Shane George, James Winnearls, Don Campbell, Martin Wullschleger

KEY PERSONNEL: Elizabeth Wake, Kerin Walters, Sarah Czuchwicki

COLLABORATORS: Gold Coast University Hospital (Lead), Princess Alexandra Hospital, Royal Brisbane Women's Hospital, Townsville Hospital, Queensland Children's Hospital, Rockhampton Base Hospital, Mackay Base Hospital, Cairns & Hinterland Hospital, Royal Adelaide Hospital, Women's & Children's Hospital Adelaide, Perth's Children's Hospital, Royal Alexandra Hospital, Westmead.

FUNDING: Emergency Medicine Foundation | Trauma and Disaster Management

DURATION: Commenced: June 2018 | Expected Completion: July 2021

There is evidence that fibrinogen deficiency plays a significant role in TIC, particularly in children. The FEISTY Junior Trial therefore aims to replicate FEISTY, appropriately modified for the paediatric population of 3 months to 18 years. As there are no published studies comparing Fibrinogen Concentrate and Cryoprecipitate in the paediatric population, the aim is to develop an evidence base in paediatrics that is as robust as that in the adult setting for severe traumatic haemorrhage.

We hypothesise that fibrinogen replacement in severe traumatic haemorrhage in children can be achieved more rapidly with a more predictable dose response using Fibrinogen Concentrate compared to Cryoprecipitate.

The FEISTY Junior study will investigate the use of Fibrinogen Concentrate against currently accepted standards of fibrinogen supplementation – cryoprecipitate using an accepted viscoelastic haemostatic assay (VHA) algorithm.

Recruitment: 5/68

TRAUMA VERIFICATION

THE ALFRED - TRAUMA VERIFICATION

FUNDING: Emergency Medicine Foundation | Trauma and Disaster Management

DURATION: Commenced: June 2018 | Expected Completion: July 2021

The Royal Australasian College of Surgeons (RACS) Trauma verification is a multi-disciplinary inter-collegiate benchmarking process that measures trauma services against pre-agreed standards, and that ultimately helps improve standards of trauma care. Trauma verification covers all phases of acute care from pre-hospital through to discharge and identifies the strengths and weaknesses of the hospital's trauma service, and provides recommendations for further improvement.

Formal Trauma Verification provides an opportunity:

- Critically evaluate the structure, staffing and resources within the institution involved in management of trauma patients;
- Hospitals to recognise and demonstrate their commitment to the provision of care for the seriously injured patient; and to exchange ideas and solutions to shared problems.

The RACS Trauma Verification process consists of:

- Pre-review questionnaire – a comprehensive questionnaire detailing the strengths and improvement opportunities of the trauma service
- Model resource criteria – a document that contains descriptors of the levels of trauma services in Australasia, that is used to review and benchmark the hospital trauma service
- Site review – a process that commences with evaluation of the site's pre-review questionnaire by a team of multi—disciplinary team of trauma experts, followed by a Formal Trauma Verification site visit where the team meets with key trauma service staff, make a detailed tour of the facilities and medical chart reviews.
- Reporting – consisting of a verbal feedback post site review, and a comprehensive written report 12 weeks post site review.
- Certificate - where no critical deficiencies have been discovered, the hospital will receive a certificate which is valid for 3 years. At the completion of 3 years a return verification visit is required.

As the leading major trauma service in Australasia, Alfred Health were instrumental in the development of the Australasian verification process, and were a pilot site for the 2000 consultation survey to establish the program. In addition, Alfred Hospital staff have been actively engaged as site reviewers and are acutely aware of the benefits of Trauma Verification in focussing the hospital on Trauma Services, quality, audit and patient safety. Trauma Verification has been widely taken up by hospitals in NSW, WA, QLD & NT, however, prior to 2018, the Alfred had yet to undergo the formal process.

The Alfred Hospital commenced the RACS Trauma Verification process in May 2018. The pre-review questionnaire was returned to RACS in October 2018. On the 22nd November, the RACS Formal Trauma Verification team commenced the site review, meeting with key Alfred Trauma Service staff, making a detailed tour of the facilities (including the NTRI) and conducting a number of medical chart reviews. At the completion of the Formal 2-day Trauma Verification visit the team verbally confirmed The Alfred meets the requirements of Level I trauma service, and that no critical deficiencies were found. The formal report is expected early in 2019.

APPENDICES

NTRI STAFF LIST

CLINICAL RESEARCH STAFF		PROFESSIONAL STAFF	
Prof Mark Fitzgerald	Director	Ms Kim Williams	Administrative Manager
A/Prof Joseph Mathew	Head, International Programs (South Asia)	Dr Teresa Howard	Manager, Innovation & Research
Ms Meei Yeung	Deputy Director of Surgical and Trauma Services	Dr Yen Kim	TR&R Project Officer
Prof Biswadev Mitra	Head, Clinical Research	Ms Jessica Bradford	Administrative Assistant
A/Prof Gerard O'Reilly	Head, International Programs	Ms Annie Carter	Research Administrative Assistant
Ms. Ellaine Boo	Head International Programs (East Asia)	Ms Laura McEntaggart	Project Coordinator & Trauma Registry Assistant
Prof Peter Cameron	Head, Academic Programs	Ms Lia Young	Design & Marketing Assistant
Dr Kate Martin	General & Trauma Surgeon	Aman Thakur	Finance Officer
A/Prof De Villiers Smit	Head, Emergency Medicine	**P.A.R.T.Y. STAFF**	
Dr Helen Ackland	Senior Clinical Research Fellow	Ms Anna Gunn	Program Coordinator
Prof Robert Medcalf	Head, Neurotrauma & Haemostasis Group	Ms Hayley Ball	Research and Development Coordinator
Dr Jin Wee Tee	Head, Spine Trauma Research	Ms Sue Smith	Nurse Research Officer & P.A.R.T.Y. Coordinator
Dr Rob Gocentas	Clinical Research Fellow	Ms Steph Riley	P.A.R.T.Y. Coordinator
Dr Peter Finnegan	Clinical Innovations Fellow	**REGISTRY STAFF**	
Dr Francis O'Keefe	Clinical Education and Research Fellow	Ms Louise Niggemeyer	Manager, Trauma Registry
Dr Alex Olaussen	Clinical Research Fellow	Ms Zoe Cheung	Trauma Registry Assistant
Dr Pras Thaveenthiran	Clinical Research Fellow	Mr John Dyer	Trauma Registry Assistant
Mr Matthias Russ	Orthopaedics and Trauma Research Fellow	**EDUCATION STAFF**	
Dr Jiun Kae Pui	Trauma & Critical Care Development Consultant	Dr Mike Noonan	NTRI Research & Education Fellow
Dr Adam Bystrzycki	Clinical Research Fellow	Dr Amit Maini	Head, Emergency Medicine Training
Dr Simon Hendel	Clinical Research Fellow	Dr Cecil Johnny	NTRI Research & Education Fellow
Dr Patryck Lloyd-Donald	Clinical Research Fellow	Dr Chris Groombridge	NTRI Research and Education Fellow
Ms Clare Stewart	Trauma Nurse Specialist Coordinator	Dr Helen Stergiou	Clinical Research Fellow
Dr Andrew Lim	NTRI Research Fellow	Ms Emma Lim	Project Manager, Trauma Team Training
Dr Jennifer Jamieson	NTRI Research Fellow	**HONORARY RESEARCHERS**	
Dr Marc Schnekenburger	NTRI Research Fellow	Dr Terence Tan	Clinical Research Fellow, Spine Trauma
Dr Rhondir Jithoo	Clinical Research Fellow	Dr Hui Qing Lee	Clinical Research Fellow, Spine Trauma

HONORARY STAFF – CONTINUED	
Dr Ian Mosley	Honorary Researcher
Milly Huang	Honorary Researcher, Spine Trauma
Sinem Gultekin	Honorary Researcher
Adrienne Lui	Honorary Researcher
Mayank Vasudeva	Honorary Researcher
Barry Kweh	Honorary Researcher, Spine Trauma
NTRI GOLD COAST STAFF	
Prof Martin Wullschleger	Head, NTRI Gold Coast
Dr Don Campbell	Deputy Head, NTRI Gold Coast
Mr Ben Gardiner	Trauma Registry Consultant
Mr Matthew Scott	Trauma Education Coordinator
Ms Kate Dale	Trauma Nurse
Elizabeth Wake	Trauma Research Coordinator
Ms Sarah Ryan	Administrative Officer
NTRI SUB-CONTRACTED STAFF	
Ms Jane Ford	KSMC Registry Manager
Ms Emily McKie	ATR Registry Manager
Ms Sara Calthorpe	
Ms Sharon O'Brien	
NTRI FORMER STAFF	
Ms Dina Farjou	Project Manager (Middle East)
Mr Roy Chow	Senior Finance Officer
Ms Madonna Fahey	Project Officer
Ms Janet McLeod	Program Coordinator
Ms. Sharon O'Brien	Trauma Registry Nurse
Ms Briony Milesi	Project Coordinator
Ms Cecily Schwab	Manager, Strategic Direction
Ms Robyn Goodwill	Senior Manager

STUDENT LIST

BACHELOR OF MEDICAL SCIENCE (BMedSci)		
2016		
Lachlan Evans	Neurotrauma CT Brain Interpretation	Mark Fitzgerald
Jordan Bade-Boon	Traumatic Aortic Injury	Biswadev Mitra
Edward Saxby	Management of Subarachnoid Haemorrhage Patients	Helen Ackland
Shradha Nikathil	Violence in the Emergency Department	Biswadev Mitra
2017		
Michayla Doherty	Trauma in the Elderly	Mark Fitzgerald
Toby O'Brien	Coagulopathy in Traumatic Brain Injury	Biswadev Mitra
Clare Stark	Troponin After Syncope	Biswadev Mitra
Gowri Shivasabesan	Missing Data in Trauma Registries	Gerard O'Reilly
2018		
Sophie Thorn	Early Prediction of Acute Traumatic Brain Injury	Biswadev Mitra
Irfan Fathurruhman	IV Access in Traumatic Shock	Mark Fitzgerald
BACHELOR OF BIOMEDICAL SCIENCE HONOURS (BBiomedSc)		
2017		
Cindy Wong	Semi-automated Pleural Decompression	Mark Fitzgerald
DOCTOR OF PSYCHOLOGY – CLINICAL NEUROPSYCHOLOGY (DPsych)		
2017		
Jonathan Reyes	Head Impacts in Elite and Amateur Australian Football	Catherine Willmott (Biswadev Mitra)
Jennifer Makovec Knight	Padded headgear in youth football	Catherine Willmott (Biswadev Mitra)
DOCTOR OF MEDICINE (MD)		
2017		
Shemona Rosario	The epidemiology and outcomes of patients admitted to the Alfred ICU following high level falls.	Helen Ackland
Harith Fernando	Utility of commonly requested investigations in the assessment of patients presenting with supraventricular tachycardias to the emergency department.	Biswadev Mitra

DOCTOR OF PHILOSOPHY (PhD)		
2017		
Jason Watterson	Measuring the effectiveness of the in-hospital and new on-base P.A.R.T.Y. programs (Prevent Alcohol and Risk-related Trauma in Youth) in reducing alcohol-related harms in young naval trainees.	Belinda Gabbe
Sameer Pathan	Renal colic epidemiology, renal colic pain management (RCT) and imaging (the role of beside USG in predicting complications in renal colic	Biswadev Mitra
Andre Florescu	Computer Learning for Resuscitation Decision	Mark Fitzgerald
Cristina Roman	Early pharmacist involvement in acute emergencies including stroke, severe trauma and sepsis	Biswadev Mitra
Chris Groombridge	Immediate decision making in resuscitation scenarios	Mark Fitzgerald

2016 PUBLICATIONS

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