

## PROJECT REPORT

# Queensland Trauma Education (QTE): an innovative simulation program that addresses the needs and barriers of interprofessional trauma care education across a complex landscape

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## ABSTRACT:

**Introduction:** Effective trauma care requires the rapid management of injuries. Rural and remote areas face inequity in

trauma care due to time, distance and resource constraints, and experience higher morbidity and mortality rates than urban

settings. A training needs analysis (TNA) conducted with stakeholders across Queensland, Australia, revealed a lack of contextual, accessible and interprofessional trauma education for clinicians. The Clinical Skills Development Service and Jamieson Trauma Institute developed the Queensland Trauma Education (QTE) program to address these concerns. QTE comprises a face-to-face training course and open access to online training resources created and reviewed by trauma experts. QTE also supports local training through a statewide simulation network and free access to simulation training equipment. The aim of this article is to review the QTE program and assess the benefits to clinicians in both the delivery of education and the provision of trauma care.

**Methods:** To evaluate the QTE program, a desktop review was conducted. This included analyses of website data, course and website content, and facilitator, stakeholder, participant and user feedback. The data were evaluated using the RE-AIM (Reach, **Keywords:**

Australia, interprofessional, simulation, training, trauma.

Effectiveness, Adoption, Implementation, and Maintenance) framework, and the program's alignment with the original TNA outcomes was assessed.

**Results:** The results showed that QTE aligns with the identified training needs. Specifically, QTE provides trauma education that is relevant, sustainable, employs best practice, is locally delivered, provides continuous support, is multidisciplinary, multi-platformed, physically accessible and accredited by the Australasian College for Emergency Medicine. The review also highlights how QTE has effectively been reaching its target population, improves knowledge and skills, has become widely adopted, and been implemented and maintained with relative success.

**Conclusion:** The innovative QTE program addresses the previous deficits in trauma education and meets the needs identified in the TNA. The review also reveals further opportunities for continuous improvement and program sustainability.

## FULL ARTICLE:

### Introduction

Injury from trauma is the leading cause of death in Australia for people aged 1–44 years<sup>1</sup>. Death from trauma is most likely to occur within the first hour of an incident; however, many fatalities are preventable if efficient and effective care are provided<sup>2,3</sup>. Unfortunately, rural and remote areas face greater time, distance and resource constraints in providing emergency care, and subsequently experience higher rates of morbidity and mortality than urban settings<sup>4–6</sup>. In the state of Queensland, Australia, approximately 40% of the five million residents live in rural and remote areas that span across 1.7 million square kilometres<sup>7,8</sup>. Although the vast Queensland landscape cannot be changed, individual hospitals and health services can ensure that clinicians are equipped with the knowledge, tools and skills to successfully manage these emergency conditions as efficiently as possible.

In Queensland, each of the 16 hospitals and health services are responsible for developing and delivering their local trauma resources. However, limited communication and collaboration across the vast service areas often means individual facilities develop and deliver their own trauma education programs or outsource the work to external organisations. This produces inconsistencies in the content, processes, volume and regularity of trauma education provided across facilities, ranging from no training to full-day annual workshops. Rural and remote facilities are most disadvantaged by this unstandardised structure because they have fewer resources available for training and education and are less physically accessible than tertiary facilities.

### Training needs

Queensland's Clinical Skills Development Service (CSDS) and the Jamieson Trauma Institute (JTI) conducted a training needs analysis (TNA) to quantify the gaps and opportunities in the development and delivery of trauma care education throughout Queensland Health. The TNA involved extensive stakeholder engagement, including nursing and medical staff working in emergency departments, and clinicians from rural, regional, and tertiary hospital facilities across Queensland. Stakeholders were engaged about current training gaps, challenges and barriers to effective trauma education, and training and educational needs moving forward. The TNA also involved a review of currently available trauma education courses and resources throughout Australia, including their focus area, target audience, length and costs associated. The outcomes from the TNA revealed both key barriers to success and multiple training needs to improve the provision and uptake of effective trauma care education, particularly in rural and remote settings. The TNA outcomes are presented in Table 1.

To address these barriers and training needs, the CSDS, JTI and Queensland Trauma Clinical Network (QTCN, previously the Statewide Trauma Clinical Network) created the Queensland Trauma Education (QTE) program in 2021. QTE was established to complement, not replace, available trauma courses and resources. The aim of this article is to review the QTE program and assess the benefits to clinicians in both the delivery of education and the provision of trauma care.

**Table 1: Key barriers and core training needs identified for effective trauma education**

Barriers	Needs
<b>Rigidity</b> Limited ability to adapt and contextualise training to meet different needs across sites (in structured external courses).	<b>Relevance</b> Flexible resources that can be contextualised to suit the needs, experience levels, disciplines and contexts of different sites and teams.
<b>Cost</b> High cost of training (eg approximately \$450–\$800 for nurses and \$2200–\$3800 for doctors), plus travel.	<b>Sustainability</b> Cost-effective and easy to maintain for participants and facilities.
<b>Structure</b> Ad-hoc nature of internal training development and delivery, and varying levels of expertise across onsite staff facilitators.	<b>Best practice</b> Evidence-based resources and delivery that aligns with best practice.
<b>Continuous professional development</b> Limited course endorsement or accreditation to support CPD.	<b>Accreditation</b> Supports clinical CPD through program endorsement or accreditation.
<b>Staffing</b> Logistic and financial challenges in backfilling staff to attend external courses.	<b>Local delivery</b> Train-the-trainer models and delivery of on-the-road education to upskill local staff, capitalise on local expertise, reduce travel costs (for external courses), and maintain training standards and consistency across sites.
<b>Maintenance</b> Limited opportunities for ongoing training to maintain acquired knowledge and skills over time.	<b>Continuous support</b> Long-term learning opportunities and continual education to maintain knowledge and skills after initial acquisition.
<b>Single-discipline approach</b> Limited focus on interprofessional training despite the multidisciplinary nature of trauma care.	<b>Multidisciplinary</b> Accessible to all disciplines to support interprofessional learning.
<b>Narrow focus</b> Limited focus on the unique requirements of the trauma workforce in training.	<b>Multi-platformed</b> Accessible via multiple platforms to suit resource availability.
<b>Access</b> Characteristics of small, regional and remote facilities: <ul style="list-style-type: none"> <li>– Limited time to prepare training materials</li> <li>– Difficulty accessing relevant equipment</li> <li>– Failure to meet minimum staff numbers for local course delivery, with additional costs for staff travel and backfilling challenges.</li> </ul>	<b>Physically accessible</b> Accessible training resources and equipment regardless of location.

CPD, continuous professional development.

## Methods

### Intervention

The QTE program was developed using an iterative design process, including regular consultation with subject-matter experts from both trauma care and clinical education fields. Subject-matter experts were responsible for the creation, review and iterative revision of program materials. Learning theories relating to interprofessional education, peer-based learning, deliberate practice and experiential learning were used as the foundation for the development of the simulation-based learning program<sup>9-13</sup>.

QTE comprises a full-day face-to-face simulation course and a separate online platform of extensive trauma care tools and content, including modular training resource kits, clinical guidelines and clinical resources (eg assessment tools, flowcharts, videos, cognitive aids). QTE resources are all freely available at <https://csds.qld.edu.au/qte>. QTE is further supported by the CSDS Pocket Centre Network (PCN; <https://csds.qld.edu.au/pocket-centre-network>), a network providing access to and delivery of high-quality simulation equipment to support onsite training and education across Queensland Health facilities.

### Evaluation

The RE-AIM (Reach, Effectiveness, Adoption, Implementation, and Maintenance) framework was used as a guide to evaluate the QTE program<sup>14</sup>. A mix of qualitative and quantitative measures were used to review the program against each element of the RE-AIM framework and to assess its alignment with the needs identified in the TNA. The review involved auditing the online platform (QTE website) and capturing data relating to use and access of online tools and resources, location of users, user feedback on website resources, number of face-to-face courses completed, course

locations, number of participants, form of training provided (ie internal to CSDS, on-the-road, train-the-trainer), and the equipment provided through the PCN. Face-to-face courses were further assessed using data obtained through a pre-course survey and a post-course survey.

The pre-course survey included questions regarding the participant's background (eg professional discipline, experience level, location, reason for doing the course) to allow for course adaption of content, structure and activities to suit attendees. The post-course survey included multiple-choice and open-ended questions regarding course satisfaction, value of simulation equipment, scenarios and activities, application of knowledge to practice, quality of facilitation, quality of feedback obtained, most valuable and least valuable elements of the course, and other areas of trauma education required or of interest. The measures and findings presented in this report reflect the data collected between the QTE pilot in April 2021 and September 2023. However, QTE is a continuing program with ongoing data collection and iterative quality improvement changes that may not be captured in this report. The RE-AIM model was contextualised to suit the aims and scope of this evaluation, with all measures presented in Table 2.

### Ethics approval

This project was an internal quality improvement pilot and did not require formal ethical review. However, this work adhered to all relevant ethical conduct standards and the SQUIRE V.2.0 guidelines were followed in preparing the manuscript<sup>15</sup>.

### Results

A summary of the data analysed from QTE face-to-face courses and website resources is presented using a RE-AIM framework in Table 2.

**Table 2: Evaluation of QTE using the RE-AIM framework and alignment with TNA outcomes**

RE-AIM category	Measures	Results (April 2021 – September 2023)	TNA alignment
<i>Reach</i> Has QTE reached the intended target population?	<ul style="list-style-type: none"> <li>Number of participants attending the F2F course.</li> <li>Demographics of participants.</li> <li>Number of times website resources were accessed.</li> <li>Locations of website users.</li> </ul>	<p>F2F course:</p> <ul style="list-style-type: none"> <li>205 participants attended.</li> <li>162 survey responders: <ul style="list-style-type: none"> <li>67% (108) = nursing or midwifery</li> <li>33% (53) = medical</li> <li>1 Other (eg allied health).</li> </ul> </li> <li>Participant quotes: <ul style="list-style-type: none"> <li>'Was good to be able to attend the course with colleagues working in the same department, building better communication and teamwork'.</li> <li>'The balance between nursing and medical was perfect – great to hear both sides and know considerations for both'.</li> <li>'It was great that there was a wide range of people from all across different health care facilities and clinical areas'.</li> </ul> </li> </ul> <p>Website resources:</p> <ul style="list-style-type: none"> <li>Over 64 000 website visits.</li> <li>Over 11 000 users.</li> <li>Users from across 10 countries: <ul style="list-style-type: none"> <li>Australia, US, New Zealand, UK, India, Canada, China, Qatar, Philippines, Germany.</li> </ul> </li> <li>User quote: <ul style="list-style-type: none"> <li>'Thank you for sharing such great resources [kits]. I work in Dunedin Hospital NZ, I hope you don't mind a kiwi trauma nurse coordinator using them. Australia is so much more advanced than NZ in trauma'.</li> </ul> </li> </ul>	<p>Multidisciplinary Physically accessible</p>
<i>Effectiveness</i> Has QTE been effective in improving participants' trauma care knowledge and skills?	<ul style="list-style-type: none"> <li>Participant satisfaction.</li> <li>Knowledge and skills gained.</li> <li>Application to clinical practice.</li> <li>Value of simulation equipment and activities.</li> <li>User satisfaction with website resources.</li> </ul>	<p>F2F course:</p> <ul style="list-style-type: none"> <li>99% strongly agreed or agreed that they gained additional knowledge and skills from the course.</li> <li>99% strongly agreed or agreed that attending the course would result in a change in their clinical practice.</li> <li>99% strongly agreed or agreed that the simulation equipment supported their learning.</li> <li>99% strongly agreed or agreed that the hands-on activities supported their learning.</li> <li>Participant quotes: <ul style="list-style-type: none"> <li>'I haven't received airway education this good and I'm keen to use this information and education in my practice'.</li> <li>'The course covered a wide range of trauma topics and how to apply principles and skills into practice, thank you'.</li> <li>'Course content was very useful. The simulations were difficult however I learnt a lot from them'.</li> <li>'The scenarios were brilliant and being able to watch other scenarios was good to see how other people interact can improve my practice'.</li> <li>'Great group discussions, practical sessions, simulations, extremely helpful and related to workplace environment to deliver a high standard of care to trauma patients'.</li> <li>'The multidisciplinary format meant I was able to access information that better assists my understanding of WHY I am doing/not doing something'.</li> <li>'Mix of theoretical, technical and simulation experience was appreciated. Aims of course were well defined and I believe the course achieved them'.</li> </ul> </li> </ul> <p>Website resources:</p> <ul style="list-style-type: none"> <li>100% of responders strongly agreed or agreed that the resources were pitched at the right level and were useful learning materials.</li> <li>100% of responders strongly agreed or agreed that the learning would improve their clinical practice.</li> <li>100% of responders would recommend the resources to a colleague.</li> </ul>	<p>Relevance</p>
<i>Adoption</i> Has QTE been widely accepted or employed by other facilities or organisations?	<ul style="list-style-type: none"> <li>Uptake of F2F courses.</li> <li>Uptake of train-the-trainer courses.</li> <li>Number of local facilitator led courses.</li> <li>Accreditation or endorsement with governing bodies.</li> <li>Use of website resources across settings.</li> </ul>	<p>F2F course:</p> <ul style="list-style-type: none"> <li>18 F2F courses run.</li> <li>8 on-the-road and train-the-trainer courses (Ipswich × 2, Laidley, Roma, Gatton × 2, Mt Isa, Redcliffe).</li> <li>No available data on the number of local facilitator led courses post-train-the-trainer. This data will be recorded by local facilities going forward.</li> </ul> <p>Website resources:</p> <ul style="list-style-type: none"> <li>Over 9000 downloads of training resource kits.</li> </ul> <p>Affiliations:</p> <ul style="list-style-type: none"> <li>The program is affiliated with other professional bodies (eg UQ, QTCN) to provide expert course facilitators, content developers, and reviewers.</li> </ul> <p>Accreditation:</p> <ul style="list-style-type: none"> <li>QTEC is accredited by the Australasian College for Emergency Medicine (<a href="https://acem.org.au">https://acem.org.au</a>), supporting the course's foundation in best practice.</li> </ul>	<p>Local delivery Accreditation Best practice</p>
<i>Implementation</i> Has QTE been implemented as intended? (eg cost, delivery, consistency, resources, adaptation).	<ul style="list-style-type: none"> <li>Cost to participants or employers.</li> <li>Cost to CSDS and JTI.</li> <li>Participant perceptions of course delivery.</li> <li>Variation in learning platforms and resources.</li> <li>Adaptations to adhere to program intentions.</li> </ul>	<p>Costs:</p> <ul style="list-style-type: none"> <li>No cost to participants to attend courses or access website resources.</li> <li>Costs to CSDS: <ul style="list-style-type: none"> <li>Employment of a full-time nurse Grade 7 (or equivalent) to manage and lead the QTE program (F2F and website resources).</li> <li>Medical officer – clinical lead's time for F2F course delivery, networking and resource building.</li> <li>Other clinical specialists' fees for developing and delivering education and training (approx. \$800/day).</li> <li>Delivery of on-the-road education (trauma nurse, clinical lead and clinical specialist), simulators, equipment and consumable costs for ongoing local training, and customising and contextualising training.</li> </ul> </li> </ul> <p>Course delivery:</p> <ul style="list-style-type: none"> <li>High consistency in participant perceptions of course delivery and facilitation: <ul style="list-style-type: none"> <li>98% strongly agreed or agreed that the course was suitable for them.</li> <li>98% reported that course information was pitched at the right level.</li> <li>100% strongly agreed or agreed that the facilitators were engaging.</li> <li>100% strongly agreed or agreed that the facilitators were knowledgeable.</li> <li>100% strongly agreed or agreed that it was easy to ask questions of facilitators.</li> <li>98% strongly agreed or agreed that the facilitators provided helpful feedback.</li> </ul> </li> <li>Participant quotes: <ul style="list-style-type: none"> <li>'Facilitators were AMAZING. Approachable, friendly, incredibly knowledgeable, encouraged and facilitated reflective thought, gave helpful feedback'.</li> <li>'Facilitators were incredible with their knowledge and adapted it to all streams of nursing/level of Drs'.</li> <li>'There was a good mix of educator levels and departments. Small groups allowed personalised feedback and ability to ask focused questions'.</li> </ul> </li> </ul> <p>Platforms and resources provided:</p> <ul style="list-style-type: none"> <li>F2F course: <ul style="list-style-type: none"> <li>Mannequins and other physical devices for simulation, procedural skill workshops, immersive scenarios, pictures and videos to teach and describe (eg anatomy and cognitive aids), and PowerPoint and whiteboards to generate and document small group discussions. <ul style="list-style-type: none"> <li>'Mix of theoretical, technical and simulation experience was really appreciated'.</li> </ul> </li> </ul> </li> <li>Website resources: <ul style="list-style-type: none"> <li>15 core trauma topics with multiple subtopics <ul style="list-style-type: none"> <li>abdominal, burns, chest, extremity, haemostatic resuscitation, imaging in trauma, paediatric, pelvic, pre-hospital and retrieval, spinal, trauma and the older person, trauma in pregnancy, trauma teams, traumatic brain injury, ward care.</li> </ul> </li> <li>Training resource kits <ul style="list-style-type: none"> <li>immersive scenarios, procedural skills, case discussions, role plays.</li> </ul> </li> <li>Clinical guidelines and other resources: <ul style="list-style-type: none"> <li>clinical resources, clinical assessment tools, clinical decision-making tools, patient information sheets and guides, videos, flowcharts, links to external courses, references.</li> </ul> </li> </ul> </li> </ul> <p>Adaptation:</p> <ul style="list-style-type: none"> <li>The QTE website initially required a login to access the resources. The mandatory login was removed in March 2023, with a subsequent increase in site access: <ul style="list-style-type: none"> <li>363 downloads between April and June 2022 (when login required)</li> <li>2026 downloads between April and June 2023 (when no login required).</li> </ul> </li> </ul>	<p>Multi-platformed</p>
<i>Maintenance</i> Is QTE being regularly reviewed and maintained to	<ul style="list-style-type: none"> <li>Growth of course attendance and website access.</li> <li>Maintenance and growth</li> </ul>	<p>F2F course:</p> <ul style="list-style-type: none"> <li>56 participants in 2021 and 76 participants in 2022.</li> <li>Train-the-trainer courses support facilities to deliver their own trauma education over the long-term.</li> <li>PCN has supported at least three locally facilitated QTE courses through simulation equipment loans (eg</li> </ul>	<p>Continuous support Sustainability (for users)</p>

ensure the program's long-term efficacy?	<ul style="list-style-type: none"> <li>of content and resources. Course and website sustainability.</li> </ul>	<p>Super Annie (CC Trainer). However, this data is likely underrepresented due to challenges in manually capturing these loans.</p> <ul style="list-style-type: none"> <li>High running costs for CSDS requires further funding (external to CSDS) to ensure the sustainability of the program.</li> <li>Considerations regarding the implementation of a small course fee in 2024 to assist in program maintenance and sustainability.</li> <li>Participant quotes on potential improvements: <ul style="list-style-type: none"> <li>'Pre-reading or videos could benefit those who are not critical care trained'.</li> <li>'Some sort of course pre-reading might be a helpful addition – to familiarise ourselves with the topics beforehand e.g., process for ICC insertion or handover tools that exist for trauma'.</li> <li>'I would suggest extending the course to cover other aspects including burns etc. although I understand this may not be able to be covered in one day'.</li> </ul> </li> </ul> <p>Website:</p> <ul style="list-style-type: none"> <li>18% month-after-month growth of users.</li> <li>Regular reviews and new trauma care resources are continually being developed and added to the QTE website to expand its range and relevance for different users.</li> <li>Accessible website resources provide clinicians with long-term and continued support beyond the F2F course.</li> </ul>	
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CSDS, Clinical Skills Development Service. F2F, face-to-face. ICC, intercostal catheter. JTI, Jamieson Trauma Institute. PCN, Pocket Centre Network. QCTN, Queensland Trauma Clinical Network. QTE, Queensland Trauma Education. RE-AIM, Reach, Effectiveness, Adoption, Implementation, and Maintenance. TNA, training needs analysis. UQ, University of Queensland.

## Discussion

### Overview

The findings of this review demonstrate the reach and effectiveness of QTE, where barriers and challenges remain, and where lessons have been learnt to inform future statewide education. Overall, the analysis demonstrates how QTE aligns with the original training needs identified. Alignment is evident in the variety of content and the flexibility of resources available to suit different clinical disciplines, experience levels, contexts, training platforms and needs. The program materials support onsite continuous education, including free train-the-trainer and on-the-road courses, open access to online training resources, and use of simulation equipment available through the PCN, which further highlight QTE's sustainability and accessibility. Accreditation and affiliations with multiple professional bodies also demonstrate QTE's robust evidence base and use of best practice.

Beyond the alignment with identified training needs, the program has been successful in reaching the target population (ie clinicians delivering or providing trauma care). This is evident in both course and website data, with over 200 clinicians from nursing, midwifery and medicine participating in face-to-face courses, and over 11,000 users of online resources. QTE has also been effective in improving trauma knowledge and skills, with 99% of course participants and online users agreeing that QTE supported their learning and would result in a change in clinical practice. QTE's endorsement by and affiliation with other relevant organisations (eg ACEM accreditation) further highlights the program's wider adoption and acceptance. Moreover, the program has been successfully implemented in line with initial intentions, including effective course delivery, free access and use of multiple learning platforms. QTE has also been maintained and adapted effectively over the longer term, with continuous growth in resources and clinician access.

### Limitations

Despite the benefits, further work is required. First, engagement with other disciplines that encounter trauma scenarios (eg allied health, paramedics) has been limited, despite the program being available to all specialties. Increased engagement with other professional and non-professional streams is required to improve awareness of, and access to, QTE. The current data are limited to self-report measures to assess QTE's efficacy, rather than the measurement of objective performance. However, any changes in participants' trauma care performance post-QTE could be confounded by differences in location, time between training, trauma exposure, team size and availability of resources. To address this challenge, case studies of single sites (with case-

matched controls) that have not yet received any QTE training are being planned.

Data relating to equipment usage and local facilitation of QTE courses (post-train-the-trainer) relies on manual input across facilities with varying processes, resources and constraints. This manual and unregulated process can produce discrepancies and omissions in reporting, as highlighted in the 'Maintenance' section of Table 2. Clearer reporting structures and more automated processes are subsequently required to ensure reliable and accurate data are collected going forward.

In addition, this review demonstrates how QTE provides a more sustainable training model for clinicians and facilities. However, sustainability challenges remain for CSDS and JTI. The high costs and resources associated with the continuous development and delivery of a growing QTE require external funding or changes in the cost structure to ensure the longevity and value of the program. Moreover, any changes in fee structure need to be weighed against the impact on accessibility.

### Lessons learned

Beyond the challenges involved, several learning opportunities were identified throughout the evaluation process. For example, a mandatory login was originally required to access QTE's online training resources. While the login enabled the collection of additional user data, course developers questioned its potential impact on resource accessibility. When the mandatory login was removed, downloads increased by 550% compared to the same period the year prior (when a log-in was required). This substantial increase in downloads highlights that even simple steps and tasks can impede the reach and accessibility of online resources and should always be considered during implementation and maintenance.

Additional opportunities for innovation were identified throughout regular reviews of participant, facilitator and subject-matter expert feedback, resulting in changes to the structure, content and platforms available. For example, participant feedback has led to the introduction of pre-reading materials to further scaffold and space learning, the development of a guide to assist users in the selection of relevant online resources to suit their unique training needs, and the continuous development of new trauma topics to expand QTE's accessibility and relevance. Moreover, participant feedback firmly reiterates the value of QTE's interprofessional approach to training, not only for improved technical skills in trauma management, but also for enhanced teamwork, communication and compassion. These variables can all significantly impact performance in emergency scenarios and may encourage further considerations of local system improvements<sup>16</sup>.

## Conclusion

Overall, QTE has been successful in improving the quality of trauma care education across Queensland. Although further work is required to ensure the long-term sustainability of the program's delivery, QTE provides clinicians with the necessary tools and resources to increase their trauma management skills and improve patient outcomes. QTE further supports healthcare workers based in rural and remote facilities by providing resources that are both accessible and relevant across geographically challenging landscapes.

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## Conflicts of interest

Authors KM and MM led this internal quality improvement review as employees of the CSDS, but were not involved in development, delivery or administration of the QTE program. No other competing interests are declared.

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