The Matthew effect in New Zealand rural hospital trauma and emergency care: why rural simulation-based education matters

Marc Gutenstein, Sampsa Kiuru

ABSTRACT

We describe a phenomenon of self-reinforcing inequality between New Zealand rural hospitals and urban trauma centres. Rural doctors work in remote geographical locations, with rare exposure to managing critical injuries, and with little direct support when they do. Paradoxically, but for the same reasons, they also have little access to the intensive training resources and specialist oversight of their university hospital colleagues. In keeping with international experience, we propose that using simulation-based education for rural hospital trauma and emergency team training will mitigate this effect. Along with several different organisations in New Zealand, the University of Otago rural postgraduate programme is developing inter-professional simulation content to address this challenge and open new avenues for research.

The Matthew effect describes a general pattern of self-reinforcing inequality related to economic wealth, political power, prestige, knowledge or in fact any other scarce or valued resource. Also termed ‘cumulative advantage’ or ‘success-breeds-success’, it is closely related to the concept of preferential attachment in network science, where the more connected nodes are destined to acquire many more links in the future than the auxiliary nodes. We suggest that multiple factors converge to create a rural hospital ‘Matthew effect’ in New Zealand. For trauma and emergency care, a relative lack of exposure, training opportunities, collegial support, facility and team cohesion may lead to an increasing gap in performance between rural hospital clinicians and their urban trauma team counterparts.

Rural hospital medicine is determined by its social context, the rural environment, the demands of which include professional and geographic isolation, limited resources and special cultural and sociological factors. It is invariably practised at a distance from comprehensive specialist medical and surgical services and investigations. A broad generalist set of skills, knowledge and attitudes are needed to deliver optimum patient outcomes in rural hospitals. In New Zealand, vocational training and maintenance of professional standards in rural hospital medicine is undertaken through the Division of Rural Hospital Medicine (DRHM), a chapter of the Royal New Zealand College of General Practitioners.

Inherent to rural hospital practice is trauma and emergency care. Accidental or non-accidental injuries, and medical emergencies are a function of the local population not the medical service, hence rural practitioners can expect to be exposed to a variety of significant clinical challenges. These cases are best described as “high-risk, low-frequency situations” for both the patient and the clinical team, and in these circumstances healthcare professionals require a specific set of skills to enable the translation of their knowledge into safe patient care.
A variety of compounding factors lead to differences between rural and urban trauma and emergency care. Rural providers must perform competent and safe care, yet individual practitioner exposure is limited by rural scope. Furthermore, the infrequency of exposure is itself a challenge to achieve and maintain competency in critical procedures. In contrast to urban emergency departments with resident specialist teams of emergency physicians, surgical and medical sub-specialists, a typical rural team may consist of one or two rural hospital doctors and nurses. Hence both specialist backup in critical scenarios and collegial support is lacking.

Outside direct patient care, the educational networks and resources that accompany large urban hospitals have historically also been largely absent in rural New Zealand, making opportunities to train rural emergency teams more difficult. While great gains have been made through development of the Division of Rural Hospital Medicine (DRHM) training programme, and a new national school of rural health has been proposed, the rural workforce itself is still highly dependent on overseas trained practitioners, and the institutional knowledge that builds up in larger centres may be more fragile in the rural context.

The implication of this Matthew effect is significant. A rural ‘mortality penalty’ where increased mortality from traumatic injury can be attributed to distance and terrain, has been described in Australia and the US.

In New Zealand, only 84% of the population has the theoretical pre-hospital service coverage to undergo transport to a level 1 or 2 trauma service within 60 minutes. Despite this, the needs of a rural population can equal or exceed urban populations. The incidence of moderate to severe traumatic brain injury in the rural population is almost 2.5 times greater than in the urban population. There is considerable variation across New Zealand in fatal injury rates by district health board, and current research into preventable injury deaths and identifying opportunities to improve timeliness and reach of emergency healthcare services in New Zealand is ongoing. Preliminary research findings suggest that rural areas are of major concern.

Addressing the Matthew effect: The role of simulation training

We propose that the solution to a rural Matthew effect is an investment in simulation-based education in the rural sector, and suggest that this principle is used to strengthen connections, develop inter-professional and interdisciplinary networks, and redesign rural postgraduate and post-vocational training in trauma and emergency care.

Simulation-based education is a now well established and evidence-based educational intervention. Heterogeneous evidence across multiple topic areas shows that training with simulation-based exercises increases technical and procedural performance, expertise, communication and collaboration, and more limited evidence suggests that improvements in patient outcomes attributable to simulation exercises can occur at the health system level. Benefits of rural simulation education would include the following (see Table 1).

**Table 1:** Proposed benefits of rural simulation-based education.

| 1. | Procedural skills maintenance |
| 2. | Inter-professional learning including pre-hospital teams |
| 3. | Enhanced teamwork, communication and leadership |
| 4. | Rural workforce retention and recruitment |
| 5. | Highlighting latent issues in rural practice, such as patient transfer issues |
| 6. | Standardisation of equipment and procedures |
| 7. | Improving patient safety |
| 8. | Encouraging research |
| 9. | Bridging rural practice to other New Zealand medical networks |
| 10. | Opportunities for educational faculty development |
Simulation is an ideal fit for reversing the rural inequality in dealing with high-risk, low-frequency scenarios—effectively increasing frequency of exposure while improving competence and team dynamics. Deliberate investments in rural simulation have occurred internationally in the US,13 Canada14 and Scotland.15 Examples include the development of a Rural Trauma Team Development Course,13 to which a more rapid patient transport time from rural to tertiary centres has been credited.16 Training as native teams rather than individuals may improve the resilience of small centres by cementing team-based rather than individual-based knowledge, and introducing a culture of deliberate practice and debriefing.

In New Zealand, simulation-based education can be fostered by incorporating these methods into both pre-vocational training in rural hospital medicine and continuous medical education (CME) programmes for the established workforce. This will require an inter-professional and collaborative approach. In the South Island this includes organisations such as the University of Otago Rural Postgraduate Programme17 and Rural Health Academic Centre, the district health boards, St John, New Zealand Defence Force, South Island Alliance and others. The aim should be to create a coordinated clinical simulation network across rural areas that emulates and reinforces the clinical networks that exist for patient care, and supports the promotion and sharing of rurally relevant simulation resources across New Zealand and into the Pacific.

In addition to the development of simulation courses and resources for rural clinicians, future directions for rural simulation in New Zealand include developing a robust multi-professional faculty, research into small team dynamics and simulation effectiveness, and creating a virtual network of simulation facilitators, educators and debriefers using video technology. We believe that rural simulation based education will not only mitigate the Matthew effect but will also foster collaboration across the whole health system.

Conclusions

We have described a rural hospital ‘Matthew effect’, along with a simulation-based educational strategy to mitigate this effect, strengthen connections and networks, and grow resilient rural trauma and emergency teams in New Zealand and the Pacific.

Competing interests:
Nil.

Acknowledgements:
Canterbury Simulation Interest Group; South Island Alliance; St John; Rural Health Academic Centre, Ashburton.

Author information:
Marc Gutenstein, Professional Practice Fellow, Rural Postgraduate Programme, Dean’s Department Dunedin, University of Otago; Sampsa Kiuru, Clinical Senior Lecturer in Rural Health, Rural Health Academic Centre Ashburton, University of Otago.

Corresponding author:
Dr Marc Gutenstein, Dean’s Department Dunedin, University of Otago.
marc.gutenstein@otago.ac.nz

URL:
REFERENCES:


