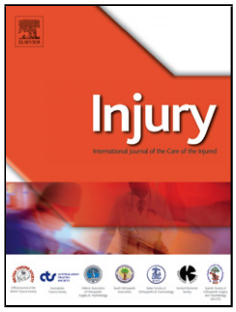

Title: Beliefs and expectations of rural hospital practitioners towards a developing trauma system: a qualitative case study

Authors: Ryan D.F. Adams, Elaine Cole, Susan I. Brundage, Zoe Morrison, Jan O. Jansen

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Beliefs and expectations of rural hospital practitioners towards a developing trauma system: a qualitative case study

Authors:

Ryan DF Adams, MBChB, Queen Mary University of London, London, UK. E: ryandavidadams91@gmail.com

Elaine Cole, PhD, Centre for Trauma Sciences, Blizard Institute, Queen Mary University of London, London, UK. E: e.cole@qmul.ac.uk

Susan I Brundage, MD, MPH, FACS, FRCSGlas, Centre for Trauma Sciences, Blizard Institute, Queen Mary University of London, London, UK. E: s.brundage@qmul.ac.uk

Zoe Morrison, PhD, University of Greenwich, London, UK. E: z.j.morrison@greenwich.ac.uk

Jan O Jansen, MBBS PhD, Division of Acute Care Surgery, Department of Surgery, University of Alabama at Birmingham, Birmingham, Alabama, USA. E: jjansen@uabmc.edu

Correspondence: Jan O Jansen

Division of Acute Care Surgery, 1922 7th Avenue South, Birmingham, Alabama 35294-0016, USA; Tel (205) 975-3030

ABSTRACT

Background

An understanding of stakeholders' views is key to the successful development and operation of a rural trauma system. Scotland, which has large remote and rural areas, is currently implementing a national trauma system. The aim of this study was to identify key barriers and enablers to the development of an effective trauma system from the perspective of rural healthcare professionals.

Methods

This is a qualitative study, which was conducted in rural general hospitals (RGH) in Scotland, from April to June 2017. We used an opportunistic sampling strategy to include hospital providers of rural trauma care across the region. Semi-structured interviews were conducted, recorded, and transcribed. Thematic analysis was used to identify and group participant perspectives on key barriers and enablers to the development of the new trauma system.

Results

We conducted 15 interviews with 18 participants in six RGHs. Study participants described barriers and enablers across three themes: 1) quality of care, 2) interfaces within the system and 3) interfaces with the wider healthcare system. For quality of care, enablers included confidence in basic trauma management, whilst a perceived lack of change from current management was seen as a barrier. The theme of interfaces within the system identified good interaction with other services and a single point of contact for referral as enablers. Perceived barriers included challenges in referring to tertiary care. The final theme of interfaces with the wider healthcare system included an improved transport system, increased audit resource and coordinated clinical training as enablers. Perceived barriers included a rural staffing crisis and problematic patient transfer to further care.

Conclusions

This study provides insight into rural professionals' perceptions regarding the implementation of a trauma system in rural Scotland. Barriers included practical issues, such as retrieval, transfer and referral processes. Importantly, there is a degree of uncertainty, discontent and disengagement towards trauma system development, and concerns regarding staffing levels and governance. These issues are unlikely to be unique to Scotland and warrant further study to inform service planning and the effective delivery of rural trauma systems.

Key Words

Rural trauma, Trauma systems, Qualitative research

INTRODUCTION

Trauma systems have been shown to reduce mortality, decrease morbidity and improve functional outcomes.[1-5] Rural trauma systems face particular challenges, related to geography, accessibility, low institutional case volume, and the need for secondary transfers.[6,7] The development of a rural trauma system, or a trauma system with a large rural component, is therefore arguably more complex than those in urban settings. The design of trauma systems in the UK has focussed on the designation of major trauma centres (MTC) responsible for managing the most severely injured. However, in rural settings, initial management is likely to be provided at a rural general hospital (RGH).[8] Patients will often not be able to access definitive care directly; requiring the trauma system to include contingencies of care, such as the provision of local life-saving surgery before transfer to a major trauma centre.

Scotland (one of the four home nations within the UK) is currently in the process of establishing a trauma system. Each year, the Scottish Ambulance Service – the *de facto* sole provider of

prehospital care in Scotland – attends approximately 80,000 incidents involving injury.[9] Around 13,000 (or 15%) of these occur in rural areas (Scottish Urban Rural Classification categories 6, 7 and 8).[10] Approximately 57,960 patients require admission to hospital as a result of unintentional injury.[11] The Scottish Trauma Audit Group records approximately 800 cases of severe injury (defined by an injury severity score of >15) per year, of which – again – approximately 15% occur in rural areas.[12,13]

Until recently, Scotland did not have a defined trauma system, and none of its hospitals were designated as trauma centers. There was no prehospital triage, and the operational policy of the health service in Scotland was to take all patients to the nearest hospital, regardless of the nature of the injuries identified, or the capability of the receiving facility. Mismatch was common, resulting in large numbers of secondary transfers.[14-16] Communication was ad-hoc, with no central coordinating body, and many requests for transfers requiring multiple telephone calls to different hospitals and specialties.

Following a number of high-level reports, the Chief Medical Officer, has called for "a bespoke, inclusive system, that operates across traditional specialty and geographic boundaries".[17,18] The Scottish Trauma Network will designate all acute hospitals as major trauma centres, trauma units, or local emergency hospitals.[17] The definitions of these types of facilities have recently been reviewed.[19] Rural critical care retrieval and transfers will be conducted by the Emergency Medical Retrieval Service, an existing physician-delivered service, which relies on a combination of fixed and rotary wing aircraft.[18] The aim of creating a national, inclusive trauma system should be viewed in the context of Scotland's geography, which includes large remote areas and many islands.[20] The development of the country's trauma system will therefore require careful consideration to accommodate the practical demands of providing rural care. Practitioners in RGHs are in a unique position to offer insight into the support required to develop an effective trauma system.

This reconfiguration of services into a cohesive system presents an opportunity to understand the implementation of a significant change programme within a variety of remote and rural healthcare settings and will inform the development of rural trauma systems in similar regions, such as North America, Scandinavia and Australasia. The aim of this study was to conduct an exploratory evaluation of the beliefs and expectations of rural hospital practitioners towards a trauma system to identify key barriers and enablers to the development of an effective rural trauma system.

METHOD

This is a qualitative study, which was approved by each of the participating health boards. The proposed work did not require the scrutiny of the Queen Mary University of London research ethics committee.

Sampling and recruitment

Scotland has a land area of 78,770 km^2, including 800 islands, although only 94 of these are inhabited. Virtually all emergency care is provided by the National Health Service (NHS). Scotland has a population of 5.2 million, concentrated in four major cities – Glasgow, Edinburgh, Dundee, and Aberdeen – each of which will have one MTC in the proposed formal Trauma System for Scotland. The northern part of the Scottish Trauma System will be formed by five NHS health boards (Highland, Orkney, Shetland, Grampian, and Western Isles), comprising six RGHs.[8] RGHs are defined as "hospitals sited in an area distant from urban conurbations which because of compromised patient travel times provide a locally based consultant led service to meet the healthcare needs of a population".[21] These hospitals "are the emergency centre for the community".[8] Some RGHs will be designated as trauma units, and others as local emergency hospitals.

Opportunistic sampling was used due to the limited numbers and availability of rural practitioners. Potential participants were contacted by e-mail. A participant information sheet was attached; explaining the background, purpose and logistics of the study. A time and place was agreed for interview with individuals, prior to obtaining written consent. The sample group included several different stakeholders of rural trauma care, including surgeons, anaesthetists, emergency physicians and nurses. All participants were involved in providing trauma care.

Interviews and data collection

Data were collected by semi-structured interviews, either individually or as part of a small group of up to four participants, in order to reduce acquiescence and habituation bias.[22-24] The topic guide was created following a review of the literature, discussion with subject matter experts, and piloting (Supplementary Material 1). [7,17,18,25,26] The guide focused on three main areas: 1) evaluating broad understanding of trauma and trauma systems, 2) views on the current trauma pathway and 3) beliefs about rural system development. Interviews were conducted in person or over the telephone, by the same researcher and recorded digitally. In order to ensure confidentiality, recordings were then transcribed and anonymised. Both recordings and transcriptions were stored on an encrypted drive. Data will be held securely for a period of five years from completion of the study to enable further analysis.

Analysis

The analysis took place in four discrete steps (Figure 1): 1) pilot coding, to develop analytical thematic framework; 2) coding of participant responses; 3) thematic synthesis and generation of belief statements; and 4) identification of key belief statements; and thus barriers and enablers. NVivo 11 (QSR International, Melbourne, Australia) was used to facilitate an iterative approach to analysis.[27] Pilot coding was used to develop coding heuristics, in order to facilitate subsequent analysis. An analytical thematic framework was developed, by identifying

emerging themes from the pilot interviews and academic literature (Table 1). Participant interviews were then coded to the framework. Related phrases from interview transcripts were grouped together by theme. Single statements were used to "provide detail about the role of the domain in influencing behaviour".[28-30] Key barriers or enablers towards the rural trauma system were then identified, according to three criteria; frequency across all interviews, presence of conflicting beliefs, and intensity of beliefs thought to impact behaviour.[29-32]

RESULTS

We conducted 15 semi-structured interviews with 18 participants from six RGHs (Figure 2). Qualitative research aims to provide depth, rather than breadth, and the sample size should be viewed in this context, rather than that of quantitative research. Three eligible participants were not interested in participating. Table 2 details the characteristics of the study hospitals. Participants included eight surgeons, eight anaesthetists, one emergency physician and one nurse practitioner. Participants had a median of 18 years of experience of providing trauma care (range 2.5 – 37 years) and a mean of 8.75 years rural trauma experience in Scotland (range 1 – 22 years). 12 of the participants were interviewed by telephone, five in their workplace and one in their own home. Four participants were interviewed together in one structured multiple-person interview. Table 3 summarises participant and interview characteristics.

The interviews generated 96 phrases, which were then synthesised into 34 belief statements. These belief statements (summarised with examples in Table 4) were grouped into three themes: 1) quality of care, 2) interfaces within the trauma system, and 3) interfaces with the wider healthcare system.

Quality of care

Participants' understanding of what constitutes "major trauma" varied, constituting a barrier. Most participants defined major trauma in terms of the need for intensive care unit admission (S.1), although some cited the injury severity score, a particular mechanism of injury or a requirement for anaesthetic involvement initially. Many participants expressed confidence in their ability to manage immediately life-threatening injuries (S.2), and the ability to provide care locally. This belief extended to confidence in providing basic rehabilitation (S.3):

> "*We can generally carry out the usual post-op rehab locally unless it's things like neuro-rehabilitation."* P.7

These beliefs could be regarded as both enablers and barriers to effective trauma system development. They related to a perceived lack of clarity regarding which trauma patients should be looked after in the setting of a RGH, and which procedures should be offered or performed (S.4):

> "*We've operated on patients but they would be destined for retrieval and transfer elsewhere*." (P.10)

This belief links to several others, relating to the role of RGHs within the network, and the quality of care provided locally, and in the developing MTC, which together constituted barriers. There was a belief that transfer to such a centre would not change clinical management (S.5) or improve care:

> "*Will it improve the quality of care for the majority? I have my doubts*." P.3

This was related to a perception that MTCs have failed to develop a specialist service, or provide added value (S.6):

> "*They're just the same surgeons as they were before so they're not providing any different service.*" P.13

Some of these beliefs may have related to a perception that patients are reluctant to be transferred long distances (S.7). The majority of participants believed the quality of trauma care in rural areas was good, although several significant barriers exists preventing effective, trauma system-led, care.

Interfaces within the trauma system

Engagement between participants and other agencies – including the Scottish Ambulance Service, the Emergency Medical Retrieval Service (EMRS), Coastguard, Mountain Rescue teams, Royal Navy and MTCs – for primary retrieval from the scene, clinical advice and secondary transfer was seen as an important enabler (S.8). However, the inconsistent application of triage (at present, only the EMRS formally triage patients, whereas road ambulances take patients to the nearest hospital, regardless of injuries) was viewed as a barrier (S.9).

Communication with MTCs was seen as an important barrier. The lack of a "single point of contact" (an identified senior clinician, with whom to liaise) was seen as problematic (S.10):

> *"I was hoping the MTC would deliver a single point of contact for us referring into (Named MTC) because that to me is the bit that's the most troublesome of the whole process."* P.5

The lack of rehabilitation coordination was another barrier (S.11). The lack of specialist major trauma services in MTCs often necessitates making direct contact with non-trauma specialists. This represented an important barrier, as the advice received is not always seen as helpful (S.12), and not always followed.

Referral to the regional MTC was felt to be difficult, constituting a barrier (S.13):

> *"(Named MTC) can be an absolute nightmare from finding the relevant person in (Named MTC) to actually accept the referral."* P.7

This issue related to the lack of a single point of contact, and the lack of specialist trauma services, as described above.

There were also mixed feelings towards the case review and education meetings organised by the region's MTC, which were felt to focus too much on tertiary care aspects (S.14). There was, however, a desire for more use of video-conferencing, to assist decision-making (S.15), although there are perceived barriers, related to accountability and responsibility. Current clinical governance was felt to be a barrier, as it was felt there were disparities in the care provided at different MTCs (S.16).

Engagement was raised as a barrier. Participants felt that there was a political agenda, both at hospital and government level (S.17):

> *"The one area that you haven't covered is politics and it's probably the most influential actually when it comes down to the practicalities of it."* P.12

There was felt to be a lack of knowledge regarding the proposed trauma system development, and a feeling of not being listened to, or part of the development (S.18). However, participants were keen to contribute to the national trauma audit (S.19) (which does not currently include any small, peripheral hospitals).

Interfaces with the wider healthcare system

Participants were keen to develop procedural skills to manage time-critical injuries (S.20), although one of the examples chosen to illustrate this point again raises questions regarding the role of RGHs, as part of the trauma network:

> *"It would be very helpful for us to actually have done a few burr holes before we're expected to do it."* P.7

The majority of participants reported being currently trained in Advanced Trauma Life Support and some instruct on courses; however, some participants added that this is not a pre-requisite for rural surgeons (P.21).[8] A key barrier was the requirement of clinicians to deal with clinical presentations that they may not have seen before (S22):

> *"I have to deal with a large variety of things very infrequently and that poses a lot of difficulty, particularly for say a younger general surgeon."* P.4

Effective, coordinated training for existing staff was a key enabler. Some participants reported that one RGH offers continued professional development (CPD) on a regular basis in a tertiary centre (S.23). Participants believed the trauma network should coordinate this training for all rural practitioners; this needs to be carefully developed as staffing levels preclude clinicians attending video-conferences or spending long periods away from their RGH (S.24).

Participants reported a knowledge gap, with tertiary centre clinicians being unaware of the extent of clinical management offered at an RGH (S.25). Interestingly, rural practitioners also commented on the lack of a tertiary trauma surgery pathway, and the difficulty of establishing trauma surgery as a specialty – akin to the North American model – in MTCs that will have very low case volumes (S.26):

> *"You've got to employ at least three or four to have a decent rota and a 24/7 service and there won't be enough trauma to do that."* P.12

Participants regarded skill development and maintenance as an important role of the network (S.27):

> *"Have a rolling programme of skills, it doesn't have to be anything particularly magical just the usual things that you need at a major trauma."* P.12

Staffing in RGHs, in general, was regarded as an important barrier. This was a key issue for many participants; with vacancies being difficult to fill and staffing likely to get worse as practitioners retire (S.24).

> *"If we can't solve it within a few years then the source of our doctors will dry out completely."* P.2

Enablers included improving the situation by rotating staff from larger hospitals and specialist 'rural practitioners' (general practitioners with additional acute care experience)(S.28). [33-35] A related barrier was insufficient numbers of trained allied health professionals impacting on care e.g. computed-tomography (CT) trained radiographers to provide 24/7 CT scanning (S.29). An additional barrier was the lack of contribution to the national trauma audit by RGHs and a lack of trained personnel preventing this engagement (S.30).

Transport was another area where participants felt the trauma network should be engaged (S.31, S.32, S.34). Poor weather conditions were a barrier, with retrieval and transfer modalities in rural Scotland often being affected (S.31):

> *"We can provide level 3 [critical care] temporarily before they transfer out but if the weather is bad it can be up to a few days."* P.15

The existing retrieval service was viewed positively; links are already established with RGHs and there is effective communication (S.32). However, an enabler was an increase in transport resource and consideration of other modes, including seaplanes (S.33).

DISCUSSION

This study provides a comprehensive insight into rural clinicians' perceptions of the barriers and enablers to implementing Scotland's trauma system. A thorough understanding of such barriers and enablers is essential if service change is to be successful. We have identified three main themes: 1) quality of care, 2) interfaces within the trauma system, and 3) interfaces with the wider healthcare system.

Quality of Care

Quality of care is a key theme pertaining to the standard of care delivered for rural trauma patients. Belief statements were connected to the meaning of "major trauma", the current confidence in abilities, the definition for level of RGH intervention and the perceived change in trauma management. Findings illustrated uncertainty amongst rural practitioners about what constitutes major trauma, and a belief that much of the necessary care can be delivered locally, without the need to transfer patients elsewhere. This belief may be, at least in part, related to the fact that the newly designated MTCs are not thought to provide better care. This is an interesting observation that relates to the decision to designate four MTCs, three of which will have very low volume (and the remaining one only moderate volume), making it difficult to develop specialist major trauma services. Practitioners at such centres may struggle to maintain necessary skills. However, following designation as an MTC, patient volume and acuity have been shown to increase, with a corresponding decrease in mortality.[36]

Such services have been shown to improve outcomes, and were called for by the Scottish Government's National Planning Forum, in the "Quality Framework for Major Trauma Services in Scotland" document. The challenge, for the wider network, will lie in establishing and sustaining specialist trauma care in very low volume MTCs.

Role of the RGH

RGHs have an essential role, as part of the trauma network. In many remote and rural locations, direct transfer to a MTC is not possible, and trauma patients therefore have to be taken to a local hospital first. The initial assessment and treatment may extend to resuscitative surgery, and it is therefore good to see that practitioners in these settings have confidence in their ability to manage trauma. However, this confidence should be tempered by a recognition that complex care, if not immediately required, is better provided in specialist centres, and that there is good evidence of a volume-outcome relationship in trauma care. The challenge here is to identify and define which patients should be treated locally, or transferred. Our findings indicate that many practitioners are uncertain about what constitutes major trauma, and prefer to treat locally, rather than engage with the network.

Further development of clinical guidelines may reduce such uncertainty. For example, a previous report, "Delivering for Remote and Rural Healthcare", published in 2008, attempted to define which emergency surgical operations RGHs should provide, listing "control of haemorrhage", "chest drainage", "pericardial drainage and suturing of penetrating cardiac injuries".[8] These categories require refinement. Haemorrhage control procedures range from simple digital control or placement of a tourniquet, to packing of a fractured pelvis. Discussion is also required as to whether, and/or when, it would be appropriate to attempt thoracotomy and cardiac repair in the setting of a small rural hospital. Similarly, clarification is required as to whether practitioners in RGHs should be expected to perform procedures, such as burr holes for extradural haematomas, in the context of a trauma system.

Interfaces within the Trauma System

The second theme focuses on the rural practitioner's interaction with the trauma system. Belief statements related to the triage process, the point of contact for the MTC, the claimed political

agenda and the lack of knowledge of system development. The reluctance to engage with the network is a major barrier, although there are also clear enablers. Practitioners valued the contributions made by the EMRS, as well as other pre-hospital care providers, which are seen as enablers. The lack of triage, except by selected providers, will be addressed shortly, when the Scottish Ambulance Service commences pre-hospital triage of all trauma patients. The relationship between RGHs and MTCs is complex, and both clinical and administrative communication is problematic. RGH clinicians frequently have to "phone around" different specialties, within an MTC, to refer a major trauma patient. A dedicated major trauma service should, again, solve this problem. It is noteworthy that many of the non-trauma specialties, despite being part of a MTC, were seen as reluctant to accept trauma patients. These findings suggest that MTCs should streamline their services to simplify referral processes. Trauma networks (and MTCs) need to improve administrative communication, to ensure that RGHs become integrated into the system.

Several study participants felt there was a political bias towards network development in urban locations. A consistently evident factor was a lack of positive engagement with the trauma network. Rural practitioners feel their views have not been acknowledged and do not have input into network development. This has resulted in many rural practitioners disengaging and is a major barrier to the planned inclusive trauma network. MTCs and networks have started to engage with regional hospitals, particularly around performance evaluation, but more work is required. Regular trauma meetings would provide a learning platform for rural practitioners, and strengthen professional relationships. Development should be disseminated to rural practitioners and the network should incorporate the views of rural practitioners into future plans.

Interfaces with the wider healthcare system

The final theme relates to the interfaces between the trauma system and the established system of healthcare, particularly in rural areas. Belief statements identified were related to training, professional development, staffing issues and a lack of resources. Accelerated transfer to the MTC is a key step in the rural trauma patient pathway.[26,37,38] However, inclement weather, the unavailability of transport resource or large distances involved often precludes patients being transferred immediately. This is currently mitigated by the close interaction with other agencies, such as HM Coastguard Search and Rescue helicopters. Inefficient retrieval and transfer is a major barrier to an inclusive system, and there is a recognition that retrieval and transfer need to be more effectively co-ordinated and the capacity enhanced to improve patient outcomes.[18,37,39]

Practitioners want to be prepared for these situations when a patient cannot be retrieved immediately. They want to ensure a high standard of care is provided in the future; with a focus on training and staffing. The American College of Surgeons has developed a specific rural trauma course, the Rural Trauma Team Development Course.[40] Kappel has shown this course to be effective in reducing delays in transfer.[41] One RGH currently provides a similar, bespoke course.[42] CPD relationships with some RGHs and tertiary centres exist to enable rural practitioners to maintain relevant resuscitative and surgical skills. Both courses and CPD opportunities offer the chance for rural practitioners to maintain skills that they are rarely exposed to and, thus, provide the best possible rural trauma care. This could be offered to all RGHs and coordinated by the trauma network.

Recruitment and retention problems, which disproportionately affect RGHs in general, also impact heavily on the ability to provide trauma care.[8] A lack of appropriately qualified staff in rural hospitals is not unique to Scotland.[43-45] Rural training programmes do not currently exist,

though have been proposed as a method of succession planning for RGHs.[46,47] Other, more novel ideas, such as the development of specialist rural practitioner model (general practitioners with additional acute care experience) and rotational consultants from regional hospitals may go some way to sustaining a limited RGH service.[33-35] These problems are not the sole remit of the major trauma network, although they are barriers to an inclusive major trauma network and addressing them would enable the provision of an efficient system into the future.

Strengths and Limitations

This study has limitations, the most important being selection bias, as with many studies of this type.[48] Participants who agreed to take part in the study may have strong negative opinions towards the trauma system. Potential participants who had positive opinions may not see the need to take a long period of time out of their day for an interview. This issue was mitigated by opportunistically recruiting as many participants as possible. A broader sampling framework might be helpful in order to accommodate the multiple stakeholders in the provision of rural trauma care. RGH practitioners are an important part of developing rural trauma management; however pre-hospital physicians, paramedics, rural general practitioners, the general public and politicians all have a role to play in the development of the rural trauma system, and should ideally be included in future work.

This study also has a number of strengths. Qualitative research facilitates examination in depth, and our study has revealed a number of important issues, which were not previously known, and would have been difficult to elicit through quantitative methods. There are many other areas with rural trauma systems, such as Australasia, Scandinavia, and parts of North America. While our finding cannot be extrapolated directly to other settings, consideration should be given to qualitative study of rural trauma care provision in these locations.

This was a scoping study, aimed as a preliminary investigation involving a subset of stakeholders. The results indicate that and a more extensive evaluation of the Scottish trauma system is warranted, to accommodate the views of all relevant stakeholders, in order to inform successful service development and provision. Qualitative research may also have a role to play post-implementation, although, it is recognised that trauma systems can take many years to mature.[49]

CONCLUSION

This study has highlighted key barriers and enablers, as perceived by rural practitioners, to major trauma system implementation. There are practical issues to overcome – such as the enhancement of retrieval and transfer capability and capacity, particular in the face of inclement weather. However, perhaps more importantly, this study appears to show a degree of uncertainty, discontent and disengagement. Rural practitioners are unsure about their role, and their hospitals' roles, within the trauma system; they are unsure about the "added value" of MTCs without specialist major trauma services; and they feel that employee engagement – at clinical and administrative levels – has not been sufficient. These are major barriers to the development of Scotland's trauma system that require urgent attention. These issues are, furthermore, unlikely to be unique to Scotland, and warrant further study, both in Scotland, and internationally.

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Figure 1 - Data collection and analysis sequence

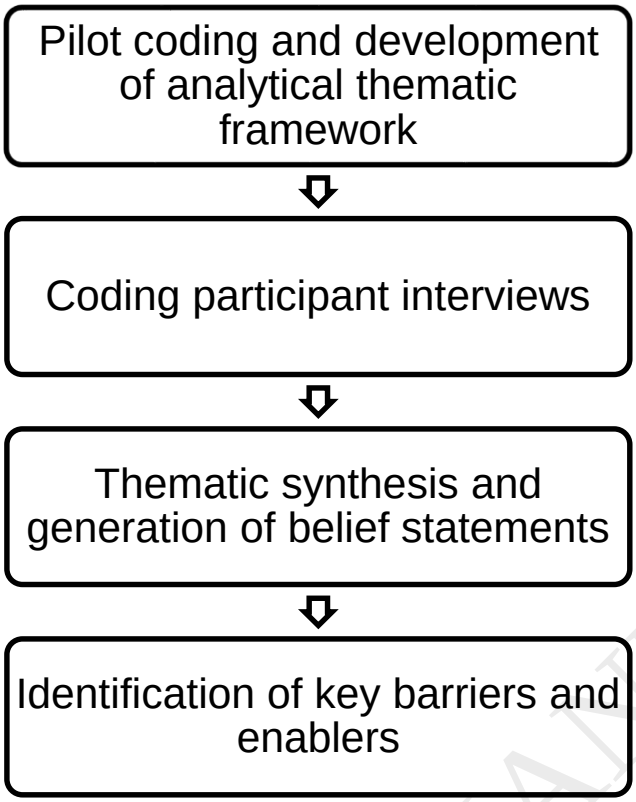
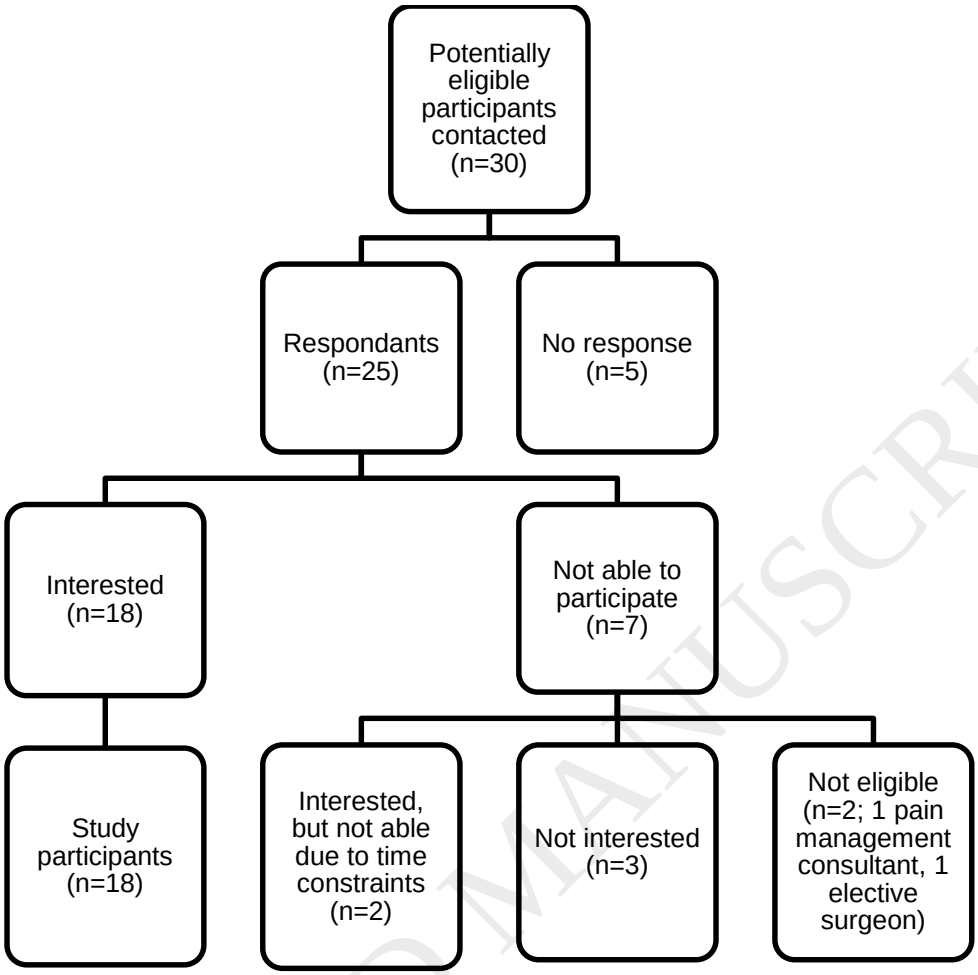


Figure 2 - Study recruitment and data generation



Tables

Table 1 - Analytical thematic framework

Main Theme	Sub-theme
Quality of care	Defining trauma
	Pre-hospital
	In-hospital
	Referral
	Rehabilitation
Interfaces with the trauma network	Engagement
	Support
	Other hospitals
	Political influence
	Administration/referral
	Clinical advice/management
	Performance evaluation
Interfaces within the wider healthcare system	Training
	Resources
	Transport

Table 2 - Hospital characteristics according to participants (* - Unknown)

	Number of major trauma cases per year (approx)	Number of hospital beds (approx)	Time by road to nearest MTC (mins)	Time by air to nearest MTC (min)	Number of surgeons, actual and required (in brackets)	Number of anaesthetists, actual and required (in brackets)
Gilbert Bain Hospital, Lerwick	5 - 20	50 - 60	Island	50	3 (3)	4 (4)
Western Isles Hospital, Stornoway	6 - 12	94	Island	50	1 (2)	2 (3)
Caithness General Hospital, Wick	<12	50	270	47	1 (*)	1 (3)
Belford Hospital, Fort William	12	37	147	30	0 (3)	1 (3)
Balfour Hospital, Kirkwall	6 - 12	48	Island	40	2 (2)	2 (2)
Lorn & Islands Hospital, Oban	10	50 - 60	130	35	2 (3)	4 (4)

Table 3 - Participant characteristics and their involvement in data collection (RGH – Anonymised reference number for RGH; ED – Emergency Department)

Participant	Profession	Type of Data Collected	Setting
1	Anaesthetist	Structured Interview	Telephone
2	Anaesthetist	Structured Interview	Telephone
3	Anaesthetist	Structured Interview	Telephone
4	Surgeon	Structured Interview	Telephone
5	Anaesthetist	Structured Interview	Telephone
6	Nurse Practitioner	Structured Interview	Telephone
7	Surgeon	Structured Interview	Telephone
8	Surgeon	Structured Interview	Telephone
9	Anaesthetist	Structured Interview	Own Home
10	Anaesthetist	Structured Interview	Office
11	Surgeon	Structured Multiple Interview	Office
12	Surgeon	Structured Multiple Interview	Office
13	Surgeon	Structured Multiple Interview	Office
14	Anaesthetist	Structured Multiple Interview	Office
15	Anaesthetist	Structured Interview	Telephone
16	Surgeon	Structured Interview	Telephone
17	Surgeon	Structured Interview	Telephone
18	Physician	Structured Interview	Telephone

Table 4 - Summary of belief statements and example quotes

Quality of Care		
State ment	Summary of key barriers and enablers	Example quotes
S.1	Lack of understanding as to what constitutes "major trauma"	'The need for intensive care or likelihood of intensive care related to the trauma would probably put it into the major category for me' P.10
S.2	Confidence in own abilities to manage trauma, though also aware of limitations and need for early transfer	'What treatment would they require? And if we can do it here then we probably would do it here' P.5
S.3	Confident providing basic rehabilitation, though not neuro-rehabilitation.	'We can generally carry out the usual post-op rehab locally unless it's things like neuro-rehabilitation' P.7
S.4	No definition for level of care/intervention at RGH or requirement of the individual staff	'We've operated on patients but they would be destined for retrieval and transfer elsewhere' P.10
S.5	Perceived lack of change in current patient management	'Will it improve the quality of care for the majority? I have my doubts.' P.3
S.6	Lack of distinction between current referral to a hospital with more facilities versus referral to a MTC	'They're just the same surgeons as they were before so they're not providing any different service' P.13
S.7	Reluctance of patients to be transferred to the mainland.	'Some to go but sometimes there is no other option' P.16
Interfaces within the trauma system		
State ment	Summary of key barriers and enablers	Example quotes
S.8	Interaction with other agencies is key (Coastguard, SAS, MRT, MoD, MTC/Other health boards)	'It's not uncommon that you can have multi-agency involvement in a trauma case' P.10
S.9	Triage is already employed in some locations, though there is no formal bypass	'A patient who's injured in Mull is more likely to be retrieved directly' P.10
S.10	Single point of contact in MTC	'I was hoping the MTC would deliver a single point of contact for us referring into (Named MTC) because that to me is the bit that's the most troublesome of the whole process' P.5
S.11	Rehabilitation point of contact and coordination by rehabilitation consultant in MTC	'One overall contact person that we can run things by who would be able to say oh that's so and so in physiotherapy who could give us some help with that' P.4
S.12	Good clinical advice from most but not all tertiary specialities	'We don't have such a close relationship with the XX and occasionally they tell us to do things and I'm just like no' P.5
S.13	Difficult referral process	'(Named MTC) can be an absolute nightmare from finding the relevant person in (Named MTC) to actually accept the referral' P.7
S.14	Mixed feelings towards trauma meetings at MTC	'It could be all the remote islands or the remote locations so it would be enough of a caseload to discuss' P.16
S.15	Use of video conferencing in rural trauma care	'I would like to use video conferencing in the acute situation but there are issues around accountability and responsibility' P.5
S.16	Governance from the major trauma system to ensure the standard of care	'Ultimately they should be so it shouldn't really matter which trauma centre the patient goes they'll get the same care' P.6

S.17	Political agenda by some hospitals and government	'The one area that you haven't covered is politics and it's probably the most influential actually when it comes down to the practicalities of it' P.12
S.18	Lack of knowledge about trauma system development	'There is nobody feeding in from us at the moment and nobody keeping links either' P.9
S.19	Keen to engage with national trauma audit	'I personally would be quite keen to score our trauma' P.4
Interfaces with the wider healthcare system		
State ment	Summary of key barriers and enablers	Example quotes
S.20	Individual staff are keen to develop procedural skills	'It would be very helpful for us to actually have done a few burr holes before we're expected to do it' P.7
S.21	Lack of basic trauma training for locum staff	'Locums are not always ATLS up to date trained' P.16
S.22	Lack of training current trainees to work in rural settings	'I have to deal with a large variety of things very infrequently and that poses a lot of difficulty, particularly for say a younger general surgeon' P.4
S.23	CPD at tertiary centre available in some RGHs	'If we could get at least two weeks a year in a hospital where we could get more exposure' P.15
S.24	Staffing difficulties, across majority of RGHs	'If we can't solve it within a few years then the source of our doctors will dry out completely' P.2
S.25	Knowledge gap of tertiary centre clinicians of the level of clinical management and remoteness of RGHs	'If we could somehow achieve some better communication and better understanding of each other's point of view that would be extremely important' P.9
S.26	No training of trauma surgery as a specialty in Scotland	'You've got to employ at least three or four to have a decent rota and a 24/7 service and there won't be enough trauma to do that' P.12
S.27	Network should coordinate skill improvement and maintenance for time critical procedures	'Have a rolling programme of skills, it doesn't have to be anything particularly magical just the usual things that you need at a major trauma' P.12
S.28	Staff rotation from other centres	'In my mind if we had an outreach service with rotational arrangements' P.9
S.29	Difficulties with radiology, including both OOH scanning and reporting of scans in a timely manner	'If we've got a CT trained radiographer then it's fine. If we don't it's a big problem' P.7
S.30	Lack of resource e.g. audit team	'I don't have a research nurse or an audit nurse and my nurses are bloody busy doing lots of other things' P.5
S.31	Weather dependent pre-hospital retrieval and secondary transfer	'We can provide level 3 temporarily before they transfer out but if the weather is bad it can be up to a few days' P.15
S.32	Positive interaction with EMRS	'What helps currently is good communication with the retrieval team' P.2
S.33	Improved transport system with more/different airframes.	'We have water just outside, whereby boat planes could be used' P.13

(P - Participant number; SAS – Scottish Ambulance Service; MRT – Mountain Rescue Team; MoD – Ministry of Defence; MTC – Major Trauma Centre; XX - Anonymised tertiary hospital service; ATLS – Advanced Trauma Life Support; OOH – Out-of-hours; CT – Computed Tomography; EMRS – Emergency Medical Retrieval Service)