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Novel application of multi-facility process map analysis for rapid injury care health system assessment in Northern Malawi

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ABSTRACT

Objectives We used the process mapping method and Three Delays framework, to identify and visually represent the relationship between critical actions, decisions and barriers to access to care following injury in the Karonga health system, Northern Malawi.

Design Facilitated group process mapping workshops with summary process mapping synthesis.

Setting Process mapping workshops took place in 11 identified health system facilities (one per facility) providing injury care for a population in Karonga, Northern Malawi.

Participants Fifty-four healthcare workers from various cadres took part.

Results An overall injury health system summary map was created using those categories of action, decision and barrier that were sometimes or frequently reported. This provided a visual summary of the process following injury within the health system. For Delay 1 (seeking care) four barriers were most commonly described (by 8 of 11 facilities) these were 'cultural norms', 'healthcare literacy', 'traditional healers' and 'police processes'. For Delay 2 (reaching care) the barrier most frequently described was 'transport'—a lack of timely affordable emergency transport (formal or informal) described by all 11 facilities. For Delay 3 (receiving quality care) the most commonly reported barrier was that of 'physical resources' (9 of 11 facilities).

Conclusions We found our novel approach combining several process mapping exercises to produce a summary map to be highly suited to rapid health system assessment identifying barriers to injury care, within a Three Delays framework. We commend the approach to others wishing to conduct rapid health system assessments in similar contexts.

STRENGTHS AND LIMITATIONS OF THIS STUDY

- ⇒ Process mapping is a method with promise for application within rapid injury care health system assessments in low-resource contexts, such as Northern Malawi.
- ⇒ We synthesised a visual summary of the process following from 11 health facilities using a Three Delays framework to illustrate commonly occurring decisions, actions and barriers involved in seeking, reaching and receiving quality injury care in the health system.
- ⇒ Such process maps can be used to not only identify the existence of care barriers, but also their relative place of influence or action to develop a deeper understanding of the complexity and help to shape potential interventions.
- ⇒ Our study represents a novel application and analysis of process mapping and we commend the approach to others wishing to conduct rapid health system assessments in similar contexts.
- ⇒ We used healthcare workers as participants and may have missed insights from a patient or community perspective.

INTRODUCTION

Injuries are a major global health burden accounting for more deaths than HIV, tuberculosis and malaria combined, with most occurring in low/middle-income countries (LMICs).[1] Morbidity and mortality attributable to injury varies globally, which can be explained in part by variation in health system response.[2–5] Indeed, a third of injury deaths could be avoided if the gap seen between high-income countries and LMIC survival rates were closed.[2]

Health systems are complex adaptive systems representing a challenging or 'wicked' problem to understand.[6] They are built out of historical contexts, rooted within human institutions, influenced by social behaviours governing function and performance and respond to interventions in unpredictable ways.[7 8] Meaningful assessments should therefore include the whole health system if the desired outcomes are to support impactful health system improvement.[9] However, most trauma care research has focused on facility

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care with very little studying the broader injury care ecosystem.[10] The Three Delays framework investigates health system factors delaying care seeking (Delay 1), reaching a place of care (Delay 2) and receiving appropriate, quality care (Delay 3)[11] and thereby aligns effectively with a whole health system assessment. Use of this framework, originally described and extensively employed within maternal and child health settings,[11 12] has recently grown momentum in other fields such as surgical and injury care.[3–5 10 13]

Injury care health systems are under-resourced and under-researched within LMICs.[1 14] Rapid health system assessment methods could efficiently identify needs and monitor interventions, useful for quick acquisition of data and to overcome resource or logistical constraints precluding more laborious research techniques.[15] Rapid assessments adopt principles of pragmatism, use of multiple data sources, speed and cost-effectiveness.[16] Usually within short time scales measured in months.[15 17 18]

Process mapping is a method with promise for application within rapid health system assessments. The method visually demonstrates steps and decisions in a process and relationships between steps. It was developed from engineering, but has been adopted in business management and more recently, healthcare to achieve improvements through making processes visible.[19 20] Process mapping has been highlighted as a methodology useful for applying systems thinking to health systems research and shedding light onto complex systems.[21] It has utility for describing a system's boundaries, analysing stakeholder relationships and engagement and identifying problems and their solutions.[21] Process mapping is credited with being a versatile, simple technique,[22] which is low cost and requires limited training to facilitate,[23] consistent with rapid assessment principles.

Trauma is a substantial cause of mortality and morbidity within Malawi, accounting for 19% of non-communicable disease and injury disability-adjusted life years and 6.4% of all deaths.[24] As is common globally, young and economically active individuals are predominantly affected; in Malawi, 82% of injury burden affects those under 40 years.[24] One-third of road traffic collisions cause a fatality, with an average age of 32, with death more likely following collisions in rural areas, where the majority of Malawian's live.[25 26]

Few studies have examined the trauma care health system in Malawi. These have found facility-based human and physical resources for injury care are often below internationally recognised best practice standards,[27] with substantial equipment shortages, including critical items, particularly at the district hospital level.[27]

Most studies on injury care within Malawi have focused on facility-based care. There is limited evidence available about prehospital care, transport and reaching care and almost nothing understanding population barriers to seeking care following injury, in keeping with the limited global literature on this subject.[28]

We aimed to use the process mapping method and Three Delays framework, to identify and visually represent the relationship between critical actions, decisions and barriers to access to care following injury in the Karonga health system, Northern Malawi. We further reflected on its utility as a rapid assessment method.

METHODS

Setting

Process mapping was conducted at health facilities serving the Karonga Health and Demographic Surveillance Site (HDSS), Karonga District, Northern Malawi. The HDSS has surveyed a population of over 40 000 since 2002.[29] It is based in the surrounds of Chilumba, in the south of Karonga district. Karonga is a predominantly rural lakeshore district, typical of a Malawian subsistence economy community dependent on farming and fishing.[29] The HDSS population are mostly rural although approximately 15% live in semi-urban settlements.

The Malawian government provide free facility healthcare to all residents, although out-of-pocket household payments still occur.[30] Traditional healers are recognised by the population as deliverers of health services, but with little link to the formal health system.[31] In addition to doctors, non-physician clinicians provide a substantial proportion of healthcare within Malawi.[32] Medical assistants and clinical officers usually staff primary facilities and are both non-physician clinician cadres within Malawi who have completed a 2-year certificate or 3-year diploma, respectively.[27] The private sector consists of private for-profit and private not-for-profit providers, mainly the Christian Health Association of Malawi (CHAM), which provides services and trains healthcare workers (HCWs).[33] The Karonga HDSS population is served by local primary facilities run by the government including a military facility accessible by civilians, private-for-profit and CHAM providers. Secondary care facilities include a government facility 70 km north and CHAM facility 40 km south over difficult hilly terrain. Tertiary care is provided in a government facility in the regional capital Mzuzu, 150 km south. All 11 facilities serving the HDSS population were included.

Data collection

Identification of participants

HCWs in each facility serving the Karonga DHSS population and identified as serving injured patients were invited to participate in process mapping workshops. Participants were eligible if they had insight into the process of care for patients following injury in deciding to seek care, successfully reaching care and receiving good quality care. Participants could be any staff cadre, not just clinicians, who understood aspects of these processes between four and eight participants per facility were requested to take part. A senior staff member identified a convenience sample of suitable participants in each facility.

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Figure 1 Illustrating the collaborative stakeholder process map creation workshop (consent from identifiable individuals obtained).

Process mapping conduct

Participants took part in a facilitated group mapping session lasting approximately 1.5–2 hours, at a convenient time and quiet location in each facility. JW facilitated the workshops in English, in which healthcare professionals are fluent. Workshops began with a presentation introducing the Three Delays framework, process mapping as a concept (with examples of similar studies[20 23 34]) and specific instructions for this study's conduct.

The Three Delays were marked onto A1 paper as horizontally orientated 'lanes' for structuring the maps onto which post-it notes were applied. Orange square post-it notes were used to signify the start and end of processes, crossing lanes where appropriate. A drawn arrow indicated the direction of a process. A blue square post-it note designated an action (a specific step in the process), a diamond orientated green post-it identified a decision (a decision point in the process with different alternatives outcomes) and a purple diamond orientated post-it signified a barrier (something that could cause delay within the process). Figure 1 illustrates an example of the workshop in action. Such a post-it note technique is common and allows for group participation and rapid map adjustment during discussion.[23]

Four maps were created in each facility with specific reference to four hypothetical sentinel injury scenarios (1) a farmer kicked in the chest by a cow sustaining a blunt chest injury causing tension pneumothorax, (2) a young adult male stabbed during an assault outside a bar causing penetrating abdominal injury with hypovolaemic shock, (3) a young adult female falling from the roof of her home sustaining a severe head injury and (4) a motorcyclist hit by a taxi on the main road and sustaining an isolated lower-limb open fracture. These life or limb-threatening injuries represent a range of required diagnostic and management skills for individual patient care, and were used to ensure that the majority of processes were considered in the exercise. They cover eight of WHO's Essential Trauma Care 11 'specific medical goals',[35 36] and two Lancet Commission on Global Surgery 'bellwether' surgical procedures.[37] They also represent a range of mechanisms, gender and social contexts that might have implications for seeking and reaching care. They have also been used to assess care quality through vignettes in the same health system.[38]

The boundaries for describing the process of care were the patient experience from point of injury to definitive acute care. The exercise's focus was to identify the 'as is' process of care, emphasising any barriers that might cause delay. Each of the four scenarios were discussed in turn. More time was spent discussing the first scenario, with subsequent scenario discussions focused on adjusting the maps to highlight and capture any differences between the scenarios possibly driven by the setting, mechanism, or injury sustained.

Data capture

The 'as is' map for each scenario in each facility was photographed and then translated into a flow diagram using PowerPoint (Microsoft). This took place as soon as

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possible following the workshop, usually within 24 hours, always within 72. Participants were sent an electronic copy of the map they cocreated for comments, suggestions for alteration, or validation that the maps represented the map creation exercise's content. Comments were received within 7 days and the final facility maps created.

Analysis

The actions, decisions and barriers identified from creating each of the four maps per facility were tabulated using Excel (Microsoft). One author (JW) ensured similar actions, decisions and barriers from each map were grouped together through an iterative process. For the barriers, a Delphi study generated framework[13] was used to guide categorisation, while also allowing additional novel barriers to arise inductively.

For each action, decision or barrier, the number of facilities and the number of scenarios including them were recorded. Those categories reported by only 1 or 2 facilities were classified as 'rarely reported', those categories reported by 3–5 facilities were classified as 'sometimes reported', and those categories reported by 6 or more were classified as 'frequently reported'.

An overall injury health system summary map was created using those categories of action, decision and barrier that were sometimes or frequently reported. This provided a visual summary of the process following injury within the health system. The initial stakeholder validated maps were used to provide a best-fit summary for positioning the sequences of actions and decisions, and locating barriers at the proposed position of impact.

Patient and public involvement

Patients or the public were not involved in the design, or conduct, or reporting, or dissemination plans of our research.

RESULTS

Process mapping workshops took place in each of the 11 identified health facilities serving the Karonga HDSS area (one per facility) between July and October 2019. Fifty-four HCWs of various cadres took part the workshops with a minimum of 3 and a maximum of 8 in each. The most common participating cadre were nurses, 27.8% (15/54), followed by medical assistants, 18.5% (10/54) (table 1). Participants in each facility workshop discussed the four sentinel scenarios and undertook the mapping exercise, considering delays to either seeking, reaching or receiving care for each. The maps show the start and end of the process that an individual takes following an injury. Actions, decisions and barriers are included in the process maps, and these domains are shown in bold if frequently reported (n≥6 facilities) or in normal font, if sometimes reported (n=3, 4 or 5 facilities). The process mapping symbol key is shown in figure 2. Opportunities for barriers to cause delays to either seeking, reaching or receiving care within the studied population are illustrated. Figure 2 shows the summary process map from across the 11 facilities for all the scenarios. Figures 3–5 show the enlarged process map lanes for Delays 1, 2 and 3, respectively.

Table 1 Process mapping workshop participants by role

Participant roles	Total
Nurse	15
Medical assistant	10
Clinical officer	9
Health assistant/patient attendant	7
Doctor	5
Lab/radiology technician	3
Security guard	2
Midwife	2
Administrator	1

Delay 1: seeking care

No actions or decisions were reported frequently for Delay 1 (table 2). The most commonly reported action was 'self or family treatment/analgesia', described by 5 facilities. The decision point 'Is the injury perceived to be severe' was described by 4 facilities. Eight barriers were frequently described, four of which were described by 8 facilities; the Delphi derived 'cultural norms', 'healthcare literacy' and 'traditional healers', and a novel barrier 'police processes'. Police processes refer to the local requirement (perceived or actual) to obtain a police report or permission to seek care.

Delay 2: reaching care

Within Delay 2, the most commonly described actions related to taking a specific mode of transport to a health facility. The most common was 'walking/stretcher/wheelbarrow', described as a possible patient option by all 11 facilities. The only decision frequently described was deciding which facility to attend, reported by all 11 facilities. The barrier most frequently described is 'transport'—a lack of timely affordable emergency transport (formal or informal) described by all 11 facilities. The barriers most commonly influencing facility choice were 'proximity' and 'reputation/perceived care quality'.

Delay 3: receiving care

Within Delay 3, the action of attention to the patient by clinical staff was reported in all 11 facilities. The most commonly described decision was whether or not it was facility working hours (9 facilities), which affected the process required for patients to receive treatment. The most commonly reported barrier was that of 'physical resources' (9 facilities) followed by the 'lack of means to safely and quickly transfer to a more specialist facility' (8 facilities) and 'priority being given to other cases or conditions' (8 facilities) for which maternity care was often highlighted specifically.

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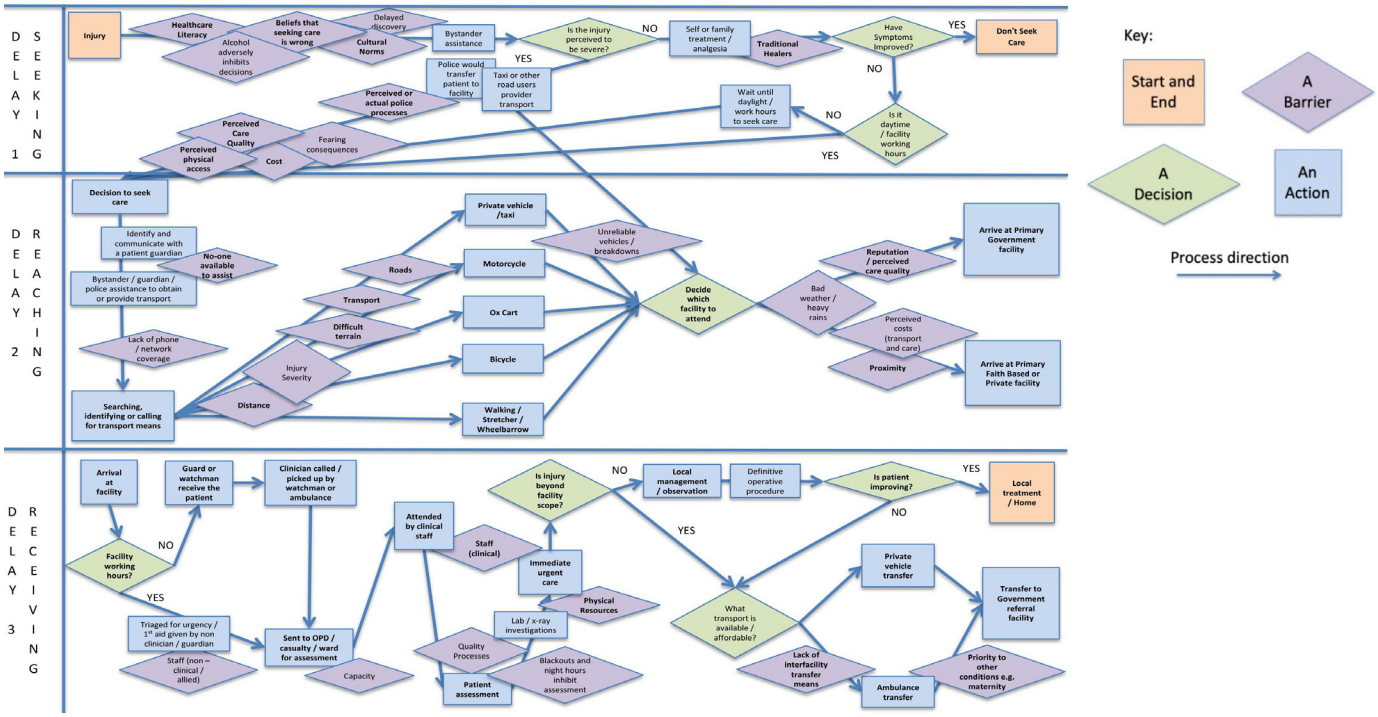

Figure 2 Pan scenario health system summary process map. Bold font: 'frequent' (6 or more facilities), normal font: 'sometimes' (3, 4 or 5 facilities). The position of barriers approximate to where they affect the process (the relative sizes of the shapes do not have significance). Each Delay lane is subsequently amplified. The figure symbol key is provided.

DISCUSSION

Our study represents a novel application and analysis of process mapping, to illustrate the commonly occurring decisions actions and barriers involved in seeking, reaching and receiving quality injury care in a health system. Such process maps can be used to identify the existence of care barriers and their relative place of influence or action to develop a deeper understanding of the complexity and help shape potential interventions.

We identified barriers to accessing timely injury care which were active across each of the Three Delays in this context. This highlights the importance of comprehensive

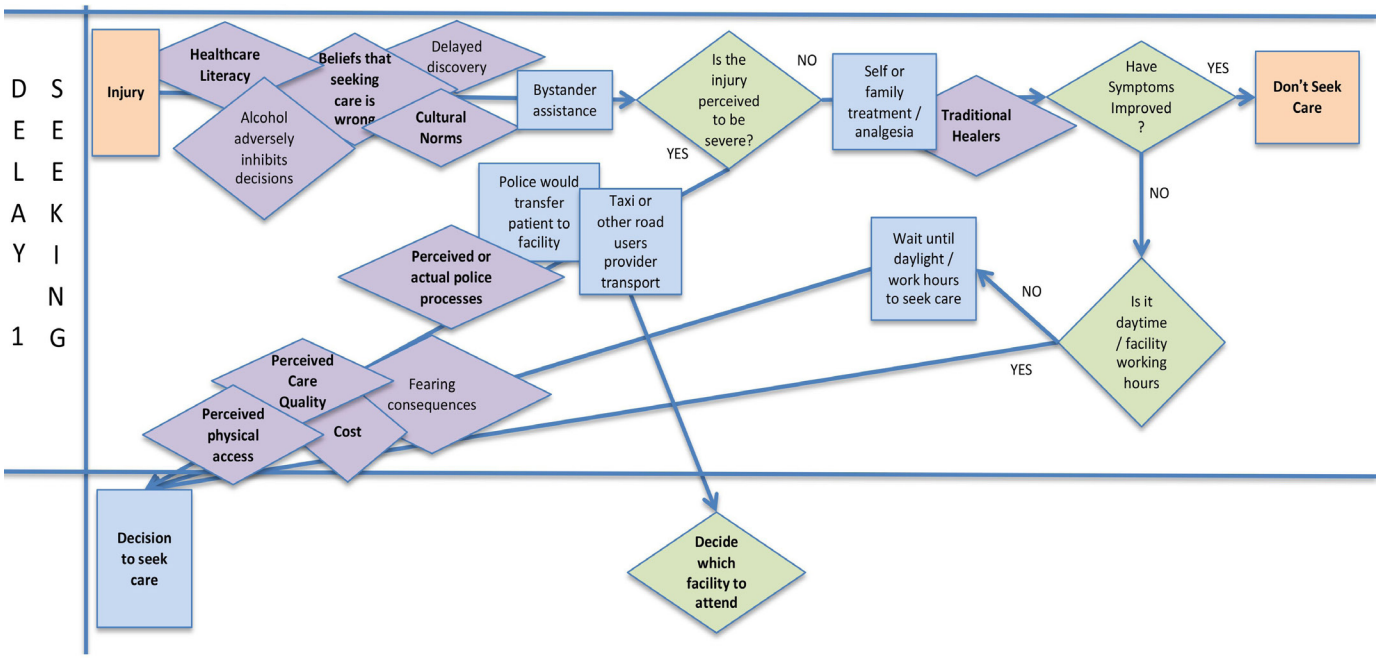

Figure 3 Summary process map Delay 1 amplified. Bold font: 'frequent' (6 or more facilities), normal font: 'sometimes' (3, 4 or 5 facilities). The position of barriers approximate to where they affect the process (the relative sizes of the shapes do not have significance).

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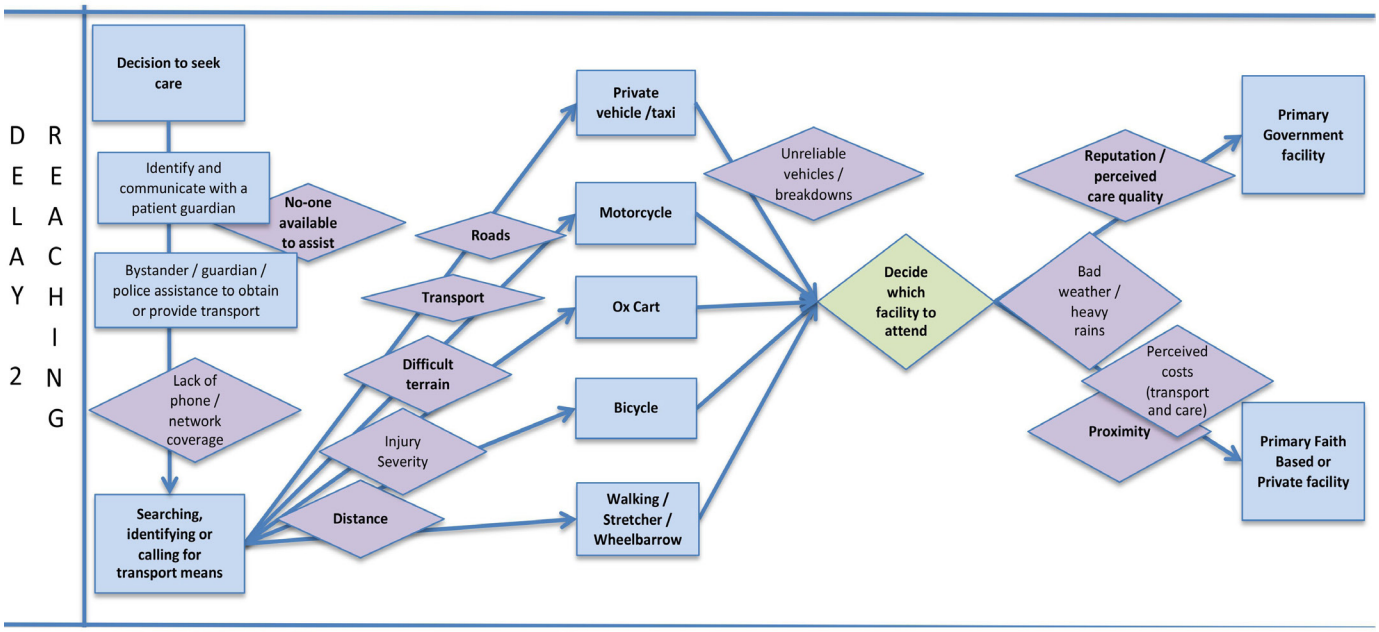

Figure 4 Summary process map Delay 2 amplified. Bold font: 'frequent' (6 or more facilities), normal font: 'sometimes' (3, 4 or 5 facilities). The position of barriers approximate to where they affect the process (the relative sizes of the shapes do not have significance).

health system assessments including the first delay, which has previously been relatively neglected in the existing literature.[10] While some authors have found little delay in seeking care following injury, particularly for open long bone fractures,[39] evidence for a real and important phase one delay following trauma in LMICs is growing.[4 40 41]

Cultural normative behaviours such as gender roles, family responsibilities and requiring someone else's permission to seek care is well established in the maternal health literature.[11 42] Our findings substantiate evidence from nearby South Africa and Tanzania that such a barrier exists for injury care too.[4 43] Health literacy encompasses the cognitive and social skills enabling individuals to access and use resources to maintain health.[44] The perception of injury severity, particularly if concealed such as internal bleeding, is one important dimension. Community surveys in comparable setting have found up to half of respondents did not seek injury care for this reason,[41 45] although objective clinical measures of severity in such studies are lacking. Injury severity perceptions may also

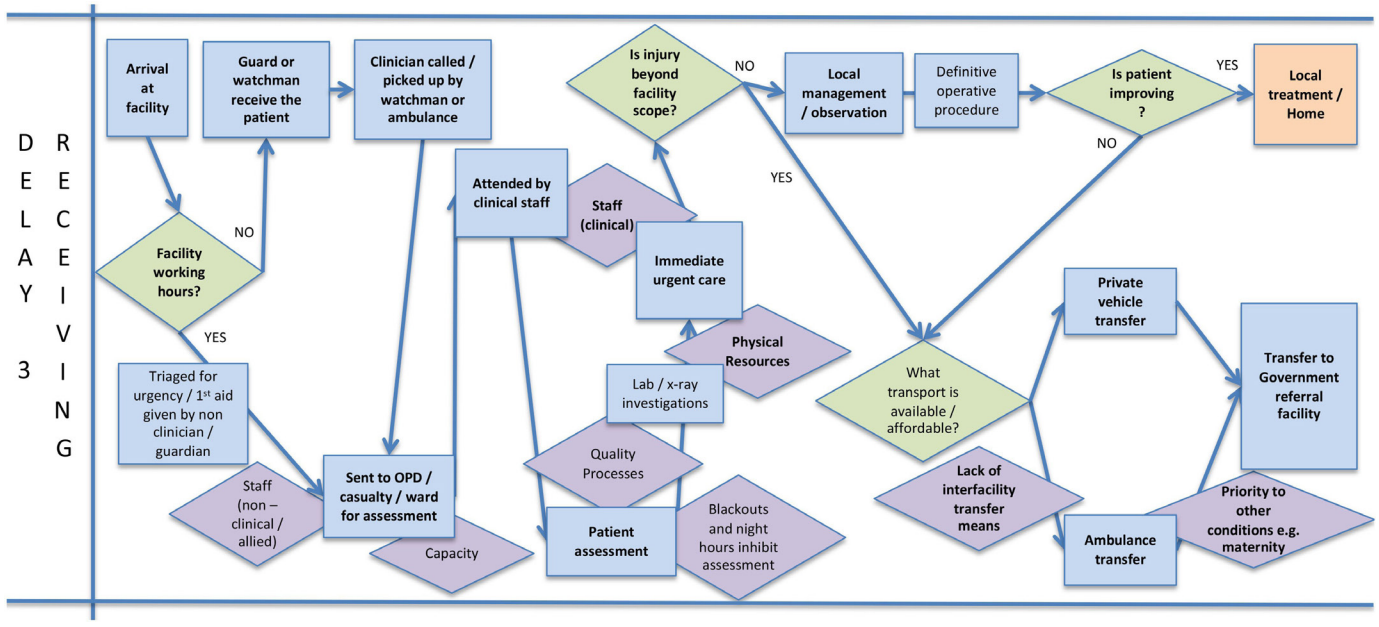

Figure 5 Summary process map Delay 3 amplified. Bold font: 'frequent' (6 or more facilities), normal font: 'sometimes' (3, 4 or 5 facilities). The position of barriers approximate to where they affect the process (the relative sizes of the shapes do not have significance).

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Table 2 Actions, decisions and barriers generated from facility process mapping workshops according to Delay

Delay 1: actions, decisions and barriers generated from facility process mapping workshops	
Key for process map table	
Frequently reported (6–11 facilities)	
Sometimes reported (3–5 facilities)	
Actions	Total facilities
Self or family treatment	5
Wait until day light/work hours to seek care	4
Police would transfer patient to facility	3
Bystander assistance	3
Taxi or other road users provide transport	3
Decision	
Is the injury perceived to be severe?	4
Have symptoms improved?	4
Is it daytime/facility working hours?	4
Barriers	
Normal cultural behaviours delay seeking care such as gender roles, family responsibilities and requiring someone else's permission to seek care	8
People don't understand about health or available healthcare	8
People prefer traditional healers	8
Patient delayed by perceived or actual police processes	8
The perceived financial costs associated with seeking care are too great	6
People perceive that care is too difficult to physically access	6
People perceive that available facility care is poor quality	6
Religious beliefs that seeking formal healthcare is wrong	6
People fear the consequences of helping an injured person, for example, being accused of causing the injury	4
There are delays in discovering injured people, including because of intoxication	3
Alcohol adversely inhibiting decision making of patient or others	3
No parent/family/guardian available	3
Delay 2: actions, decisions and barriers generated from facility process mapping workshops	
Actions	Total facilities
Transport means walking/stretcher/wheelbarrow	11
Transport means private vehicle/taxi	10
Transport means motorcycle	10

Continued

Table 2 Continued

Transport means oxcart	10
Transport means bicycle	10
Attend primary faith based/private facility	8
Searching, identifying or calling for transport means	7
Attend primary government/military facility	7
Identify and communicate with guardian to accompany patient	3
Bystander/guardian/police assistance to obtain or provide transport	3
Decision	
Decide which facility to attend	11
Barriers	
There is a lack of timely affordable emergency transport (formal or informal)	11
There is a large physical distance from place of injury to an appropriate healthcare facility	8
Difficult terrain	6
No one else available or able to assist	6
There is a lack of reliable uncongested roads with priority for emergency vehicles	6
Injury severity restricts transport options	5
Lack of phone or network coverage	5
Bad weather/heavy rains	4
Informal vehicles are unreliable/may breakdown	4
Barriers influencing facility choice	
Perceived care quality	9
Proximity	9
Perceived costs (transport and care)	5
Delay 3: actions, decisions and barriers generated from facility process mapping workshops	
Actions	Total facilities
Attended by clinical staff (nurse, non-physician clinician or doctor)	11
Patient assessment (primary and secondary survey and immediate urgent care provided)	9
Transfer to government referral facility	9
Sent to outpatient department, casualty department, dressing room or ward for assessment	8
Clinician called or picked up by guard/watchman or ambulance	8
Local management and observation	7
Interfacility transfer via private vehicle	7
Guard or watchman receive patient	6
Interfacility transfer via ambulance	6
Triaged for urgency/first aid given by non-clinician/guardians	4

Continued

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Table 2 Continued

Investigations undertaken, lab and radiological	4
Definitive operative procedure attempted	3
Decision	
Is it facility working hours?	9
Is the patient improving?	7
Is the injury severity beyond the scope of facility?	6
What transport is available and affordable?	4
Barriers	
There is a lack of reliably available necessary physical resources (eg, infrastructure, equipment and consumable material)	9
Lack of available means to safely and quickly transfer injured patients on to a more specialist facility	8
Priority given to other cases or conditions for example, maternity	8
In regard to staffing, there is a lack of reliably available, suitably trained and motivated clinical staff	7
In regard to patient demand, there is insufficient facility capacity to meet patient demand (eg, overcrowding)	4
Lack of reliably available, trained and motivated non-clinical/allied staff	4
Blackouts and hours of darkness inhibit good patient assessment and management	3
There is a lack of good quality, structured care processes for injured patients	3

vary among populations. A belief that there was no need for care following bone fracture was markedly observed in China,[40] while few Rwandans thought it unnecessary.[46] Knowing how best to respond has delayed injury care seeking in South Africa and Uganda,[4 47] and represents another important dimension of health literacy.

We found transport challenges, affordability, availability and suitability acted as a barrier in each of Three Delays. A wide range of transport options were raised. However, formal prehospital emergency transport was not mentioned with ambulances only featuring in responses for interfacility transfer. This finding is common across most of sub-Saharan Africa where an estimated 91.3% of Africa's population lacks access to emergency medical services.[48] Use of various informal methods of transport is reported in other comparable settings where private vehicles and taxis are used more often for injured patient transport than ambulances,[40 45 49] with foot and animal cart also commonly adopted.[45]

Constraints on necessary physical resources to deliver injury care is well reported both in Malawi, across sub-Saharan Africa and within LMICs in general.[10 27] Our study finding of preferential use of ambulance facilities for maternity care over injured patients is noteworthy. Priorities for ambulance services for different user groups can vary between LMIC contexts. In some settings these function exclusively, or primarily, for obstetric patients,[50–54] while in other settings trauma is prioritised.[55 5657 58] These contextually specific priorities are important to appreciate for a given health system to understand the utility of facilities for onward transfer of injured patients.

Considering the methodological approach, mapping the patient journey is an established use of the technique in healthcare.[22 23] Process mapping has been used to evaluate surgical patient care for a range of conditions[59 60] and in LMIC settings, for addressing surgical site infections in Ethiopia[20] and emergency care patient flow in Ghana.[23] However, this is to our knowledge the first application to evaluate whole injury care health systems in this way.

We found process mapping to be a highly practical method, that was easy to use and can be quickly taught and performed.[34] Process mapping has been framed as a methodology well aligned to systems thinking, facilitating understanding the 'wicked' problem of complex adaptive health systems.[21 61] Our experience showed it was effective at generating insight into potential health system barriers. The approach helped to breakdown complexity to understand reality[34] which easily incorporated the Three Delays framework as 'lanes' within the process map structure.[21]

Table 3 Summary of reflections on facility process mapping suitability for rapid health system assessment

	Speed	Pragmatism	Cost-effectiveness	Triangulation with multiple data sources
Identified performance in this study	Each workshop took only a few hours with a similar time frame for map consolidation	Pragmatic purposive staff sampling engaged a range of views. English language required with widespread WhatsApp use enabling validation	Minimal physical resource requirement and therefore cost	Different healthcare worker perspectives encouraged. This generated a substantial number of barrier ideas
Reflections on likely potential of the method for future use in rapid health system assessment	Likely to remain a quick way to generate insight, determined by the number of workshops desired for a specific study	Likely to remain highly practical, although validation may depend on electronic communication access	Additional resources are unlikely to be necessary. May need translators if not in researcher's language	Multiple perspectives are possible through caution over the role of hierarchical power dynamics in group workshop participation

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As an interactive activity, we found it engaged staff, particularly those who may not routinely have a voice.[22] It generated an end product that can be easy to understand and is highly visual[22] and although not explicit in this study, can naturally stimulate participants' improvement ideas.[23]

We used process mapping in facilities with HCWs as participants. We may have missed any benefits possible from gaining a patient or community perspective through this approach. Participants based at facilities may have less insight into barriers to seeking or reaching care, especially if these are sufficient to prevent access altogether. However, this should not be overstated as these clinicians, particularly those in primary facilities, are also members of the community with insight into their patients' daily lives and realities.[62] This was also a pragmatic consideration related to the study design as the facility process mapping workshops were facilitated by one author (JW), in English, which would not have been possible for community members where vernacular language translation would have been required.

We synthesised the outputs from 11 facility process mapping workshops into a summary map, allowing similar barrier ideas to be combined and using the frequency of occurrence in maps to represent the strength of evidence that a barrier was important in the health system. Each facility map was validated as correctly representing the output of each workshop by participants.[23] However, this was deemed not meaningfully feasible for the overall summary map since no participant was present for all workshops. Additional workshop facilitators could have been employed to potentially strengthen the validity of the summary map. This analytical approach, combining outputs from several process maps across a health system is novel and further adoption and innovation to strengthen its validity is welcome.

Our analysis allowed workshops from primary, referral, government, faith-based or private facilities to be weighted equally. However, there may be differences in both perspective and role in the health system.[33] We summarised barriers across the different sentinel injury scenarios, and used the injury scenarios to maximise capture of processes. However, we note that some barriers were associated more with one scenario than other, 'police processes' with assault and road traffic collision, is one example.[63] More granular analysis, which go beyond the scope of this paper, could further explore this nuance. Such analysis might be useful to make distinctions in health system response to different injury mechanisms or contexts which could be useful where injury epidemiology patterns vary.

Considering rapid assessment principles, our approach using workshops was quick, completing in under 2 hours per facility, although identifying participants and permission could take time, typically a half-day. Consolidating each map took little time. Other emergency care studies have produced functionally useful maps from a single workshop, particularly for projects focusing on a single facility or care process within a facility, which would make this methodology even more efficient.[23] A summary of our reflections on the suitability of process mapping for use as a rapid health system assessment method are listed in table 3.

Our approach allowed different perspectives, in our case across facilities and providers. However, workshop discussions may be tempered by hierarchical power dynamics,[64] possibly leading to clinicians, especially more senior clinicians, likely to contribute more than non-clinical staff. Therefore, careful consideration should be given to which participants should be invited, and discussions facilitated skillfully to promote equal contributions. While we used workshops, other data collection methods to create a process map can be undertaken such as observation, field notes and interviews.[20 61] These alternative approaches were deemed too time-consuming and impractical for this study and the number of facilities included. An effect of process mapping can be to promote learning and understanding among colleagues, identify gaps and opportunities for improvement.[34] While an important function of health system research, we did not specifically extend our process maps to discuss areas for intervention.

CONCLUSION

In conclusion, we found our novel approach combining several process mapping exercises to produce a summary map to be highly suited to rapid health system assessment identifying barriers to injury care, within a Three Delays framework. We commend the approach to others wishing to conduct rapid health system assessments in similar contexts.

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