ORIGINAL RESEARCH

Health Care Provision During a Sporting Mass Gathering: A Structure and Process Description of On-Site Care Delivery

Amy N. B. Johnston, PhD;[1,2,3] Jasmine Wadham, RN, MN;[1] Josea Polong-Brown, RN, BN;[1] Michael Aitken, MBBS, FACEM;[1,2] Jamie Ranse, PhD;[4] Alison Hutton, PhD;[5] Brent Richards, MBChB;[6] Julia Crilly, PhD[1,2]

1. Department of Emergency Medicine, Gold Coast Hospital and Health Service, Southport, Queensland, Australia
2. Menzies Health Institute Queensland, Griffith University Gold Coast Campus, Gold Coast, Queensland, Australia
3. Currently: Department of Emergency Medicine, Princess Alexandra Hospital Metro South, Woolloongabba, Queensland, Australia; School of Nursing, Midwifery, and Social Work, University of Queensland, Brisbane, Queensland, Australia
4. School of Nursing and Midwifery, Griffith University, Southport, Queensland, Australia
5. School of Nursing, University of Newcastle, New Castle, New South Wales, Australia
6. Intensive Care Unit, Gold Coast Hospital and Health Service, Southport, Queensland, Australia

Correspondence:
Amy Johnston, PhD
Department of Emergency Medicine
Princess Alexandra Hospital
Metro South, 199 Ipswich Road
Woolloongabba 4102 QLD Australia
E-mail: amy.johnston@uq.edu.au

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Abstract

Introduction: Mass gatherings such as marathons are increasingly frequent. During mass gatherings, the provision of timely access to health care services is required for the mass-gathering population, as well as for the local community. However, the nature and impact of health care provision during sporting mass gatherings is not well-understood.

Purpose: The aim of this study was to describe the structures and processes developed for an emergency health team to operate an in-event, acute health care facility during one of the largest mass-sporting participation events in the southern hemisphere, the Gold Coast Marathon (Queensland, Australia).

Methods: A pragmatic, qualitative methodology was used to describe the structures and processes required to operate an in-event, acute health care facility providing services for marathon runners and spectators. Content analysis from 12 semi-structured interviews with emergency department (ED) clinical staff working during the two-day event was undertaken in 2016.

Findings: Important structural elements of the in-event health care facility included: physical spaces, such as the clinical zones in the marathon health tent and surrounding area, and access and egress points; and resources such as bilingual staff, senior medical staff, and equipment such as electrocardiograms (ECGs) and intravenous fluids. Process elements of the in-event health care facility included clear communication pathways, as well as inter-professional care coordination and engagement involving shared knowledge of and access to resources, and distinct but overlapping clinical scope between nurses and doctors. This was seen to be critical for timely care provision and appropriate case management. Staff reported many perceived benefits and opportunities of in-event health care delivery, including ED avoidance and disaster training.

Conclusions: This in-event model of emergency care delivery, established in an out-of-hospital location, enabled the delivery of acute health care that could be clearly described and defined. Staff reported satisfaction with their ability to provide a meaningful contribution to hospital avoidance and to the local community. With the number of sporting mass gatherings increasing, this temporary, in-event model of health care provision is one option for event and health care planners to consider.

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Abbreviations:
ECG: electrocardiogram
ED: emergency department
QAS: Queensland Ambulance Service

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Clinical Role	n	Female	Age (range)	Years of Clinical Experience (range)	Years of ED Experience (range)
Doctors	4	1	45-56	8-36	3-25
Senior Nurse[a]	3	3	45-51	20-34	12-29
Nurse	5	4	24-38	0.5-16	0.5-11

Table 1. Demographic Characteristics and Clinical Experience of Interview Participants
Abbreviation: ED, emergency department.
[a]Senior nurse was defined as a nurse holding a clinical nurse (senior grade) paid position, rather than a given range of ED experience.

Introduction

A mass gathering is defined as an event, planned or spontaneous, where the number of people attending is sufficient to strain the planning and response resources of the community, state, or nation in which it is hosted.[1] Examples of mass gatherings include music festivals,[2,3] religious gatherings,[4] and sporting events (such as football games[1,5] and marathons[6,7]). Mass-participation sporting events, such as marathons, are increasingly common forms of mass gatherings.[8,9] Mass gatherings often occur in well-established community spaces.[10] While they can provide a significant economic benefit to local communities,[11] they can also impact upon existing community resources.[12]

To date, mass-gathering research has predominantly focused on the nature of in-event health care provision at mass gatherings,[2,4,9,13–16] as well as the in-event incidence and severity of injuries.[17–20] For sporting mass gatherings, anywhere between three percent and 18% of participants require health care,[6,17,21] often delivered on-site. With increasing popularity of running events and evidence of increasingly inexperienced runners participating in endurance events, effective injury management for many patients is important.[22] These injuries are mostly mild musculoskeletal and soft tissue injuries with only a few severe enough to warrant transport to hospital.[22,23]

For planning purposes, it is important to understand the impact on and requirements for local acute health services, including surrounding emergency departments (EDs)[10,21] during mass gatherings; however, research in these areas is limited. Calls for "development of evidence-based guidelines for medical and disaster preparedness of marathon races"[24] remain largely unanswered. Further research is also required to understand the most efficient and optimal method(s) of health care delivery during such events. The aim of this study was to describe clinical staff perspectives of the structures and processes required for an in-event health care service operating during the Gold Coast Marathon (Queensland, Australia).

Methods

Study Design

The structure and process components of Donabedian's evaluation framework,[25] including the adaptations by Irvine, et al,[26] was used to guide this qualitative, semi-structured, interview-based study.[27] Within these evaluation frameworks, structural components typically consider the resources required to operate the service/model of care (such as staff experience levels and knowledge), and organizational elements, including staffing (patient ratio/skill mix), physical, and social factors.[26] Process components include the professional roles and independent/inter-dependent relationships that are required to ensure the service can operate.[26] The pragmatic, interpretative approach adopted by the research analysis team positions the researchers within the context and enables collection of participant-generated meanings that focus on a single, locally constructed, and meaningful phenomenon;[27] namely, the structures and processes of the in-event, acute health care service.

Participants

Participants were purposively selected and invited to participate in a semi-structured interview if they met the inclusion criteria: they worked during the 2016 Gold Coast Marathon weekend, at either the in-event, acute health care service or in the main hospital ED. A range of clinical staff working in each location was invited. Twelve participants met the criteria and agreed to participate.

Study Setting

The Gold Coast Marathon[7] is one of several mass-gathering sporting events held in Australia. Since its inception in 1979, the number of participants has increased from approximately 1,000 to over 43,000 in 2017.[7] An in-event health care model has been developed and operated predominantly by local public hospital ED staff to help meet the health care needs of this unique, transient population.

For this study, the settings included the in-event health care facility and the ED. The in-event health care facility was operational for two successive mornings of the sporting mass gathering. The 750-bed, public, tertiary, teaching hospital ED (which provided staff to work in the in-event health care facility) was located approximately five kilometers from the in-event health care facility and managed 104,000 annual ED presentations for the year 2015-2016.[28]

Morning one of the marathon events includes a 2km (children's) sprint event, as well as 5km and 10km events.[7] Morning two includes the half-marathon (21km) and full-marathon (42km) events. All events take place on local roads closed to vehicle access. The track has a total ascent of 167.2 meters and a maximum elevation of 20.6 meters. Temperatures fluctuate with average July temperatures ranging from 9°C-20°C (48°F-68°F). Thus, it is considered a fast, flat track.[29]

Data Collection

Data were collected via semi-structured interviews that lasted between 16-54 minutes. These were undertaken by two experienced researchers (AJ and JW) from August through October 2016. Interviews took place in a private room within the ED at a time convenient for the participant. One participant was interviewed by phone. Each interview was audio recorded and then transcribed verbatim for analysis. Interview questions were informed by the Donabedian framework,[25] and by specific clinical components highlighted by Irvine, et al[26] focusing on describing the structures and processes required to operate the marathon health tent. Examples of questions asked of participants included: "What do you need to do your job at marathon health tent?" "Can

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you tell me about your role in delivering healthcare in the marathon health tent?" and "How do you decide if someone needs to be transferred to ED for definitive emergency care?" On-going clarification of meaning and intent was undertaken during the interview.[30] Interviews enabled researchers to capture detailed and rich descriptions of participants' personal experiences.[27,31] Some simple demographics were also recorded from participants (Table 1).

Data Analysis

Two researchers (AJ and JW) independently reviewed the transcribed interviews for accuracy prior to independent content analysis. Analysis involved coding the data, using a priori codes, and linking it to the research questions describing the in-event, acute health care facility health tent structures and processes, based on Donabedian's framework.[25,32] These codes were "structures" and "processes." Structures, within the Donabedian framework, describe the characteristics of the setting in which the health care was provided, including material resources such as equipment, location, and money/costs.[25] Structures also include the human and organizational resources required to meet organization outcomes, such as patient flow, and thus, these (material resources, human resources, and organizational resources) became the sub-codes. Processes are the processes undertaken to ensure care delivery in the in-event health care setting, and were considered in terms of independent, directed, and inter-dependent care processes by clinicians.

Sequential, deductive, and then inductive analyses of the text data were undertaken to produce a description that has capacity for transferability to other settings.[30] The inductive analysis involved reading and re-reading the data within each a priori category (Table 2 and Table 3) to develop codes that could condense extensive and varied raw text data into a brief summary format, while also establishing clear links between the research objectives and the summary findings derived from the raw data. Deductive reasoning sought to synthesize the emerging data from the particular to the general to help support broader understanding for each analysis category.[30] The process was iterative, with researchers reviewing the data and codes, and revising coding as new insights emerged.[32] For example, as an understanding of the staffing in the in-event health service emerged, researchers were better able to interpret clinical assignment patterns (task allocation/acceptance).[26] Discussion of coding with other researchers was undertaken regularly.

Rigor

Analysis of data collected used a parallel perspective, as described by Lincoln and Guba.[33] A number of measures (transferability, credibility, dependability, and confirmability) were used to enhance the rigor of this study, including purposeful sampling.[30] Data analysis included the construction of an audit trail and collection of thick, rich descriptions of participants' experiences, enabling identification of recurrent patterning to enhance dependability and trustworthiness.[34] Researchers spent time in the in-event, acute health facility and the ED to contextualize interview content, and thus, application of a self-reflexive stance that was critical and informative to enrich the dependability and credibility of data coding.[35] Rigor was increased further through the independent coding and interpretation of the raw transcript data; interviews were re-coded by another researcher to check for reproducibility of emergent codes,[36] which were finalized via consensus decision.[35] Finally, contextual details covering the setting, structures, and processes are provided, as well as direct quotes from the interviewees, so that readers can undertake their own evaluation of the generalizability of the findings.[30,36]

Ethics

Human research ethics committee approval was obtained from Gold Coast Hospital and Health Service (HREC/16/QGC/37; Queensland, Australia) and Griffith University (GU Ref No: 2016/206; Queensland, Australia).

Findings

Demographics

Demographic and clinical characteristics of the 12 interview participants are summarized in Table 1. Participants were key stakeholders including eight nurses and four doctors with a range of clinical experience.

Context

In-event health care facilities were provided to marathon staff, volunteers, bystanders, and participants within the protected boundary of the event, inclusive of the final two kilometers of track, an area with otherwise limited ambulance access and egress. Injured or ailing athletes self-presented or were assisted to the facility by first aiders, friends, volunteers, or paramedics. Treatments provided to marathon participants ranged from minor conditions (such as a dressing for blisters and abrasions) to potentially life-threatening conditions (such as myocardial infarction). Other health care provision for the event included the Queensland Ambulance Service (QAS; Queensland, Australia) and volunteer services (State Emergency Service [Queensland, Australia] and St John Ambulance Australia [Queensland, Australia]). The QAS provided paramedical assessment, management, and transport to health care facilities for event participants or spectators that typically occurred far from the in-event health care service. Volunteer first aid services provided simple, first point-of-care, primarily to spectators. The in-event health care service was co-funded between the local health service and event organizers.

Structures

Structures underpinning the in-event health care facility included human resources and organizational structures. These are presented in Table 2, along with exemplar quotes from interview participants reflecting these structures.

Human Resources

Medical and Nursing—The health service contributed human resources such as medical, nursing, and administrative staff, drawn primarily from the health service EDs, but also including ward and clinical staff from the intensive care unit. Staff were invited to work in the in-event facility via an email that requested submission of expressions of interest, and by word of mouth/prior knowledge. The number of staffs recruited was titrated based on previous and expected ED and in-event demand, the number of race registrations, and environmental conditions. Generally, six to eight nurses, three to four doctors, and one to three administrative staff worked in the in-event facility each day. Staffing varied throughout the day, based on anticipated and actual need. When staff were required at the main EDs, they could be drawn directly from the on-site health care tent team.

Structure	Example of Structure	Quote Reflecting an Example of Structure
Human Resources	Number of Personnel	"They do provide twenty-four, seven security down there" (Doctor1). "And admin officers too… Usually two to three on the Sunday two on the Saturday" (Doctor 2). "In terms of level of staff that we will look at employing we generally like to have a mixture of staff, one its good for our junior staff also our consultants too, have a chance to practice medicine in a different way, so we use it a way to give them some exposure to that" (Doctor 3). "We have to balance the staff in the tent and expertise on the floor in the main department" (Doctor 1). "We used our staffing estimates based on previous years and …. by looking at the recent year's attendances through the medical tent and looking at entries as well …. we normally have a total of about six clinical staff and on the Sunday, we usually have a total of about ten" (Nurse 1). "So, on Saturday we have approximately between six and eight nursing staff that generally work a six-hour shift down there. The doctors we tend to have just as many doctors… On the Sunday we have I think this year is was twelve nursing staff" (Nurse 5).
	Qualifications of Personnel	"It's not the place to put a lot of novice doctors and novice nursing staff, you need to make clinical decisions by parallel treatment and assessment at the same time, so you need some people who can make decisions" (Doctor 3). "Generally, like to have people who are able to function independently and make decisions independently and so for that reason we generally only target our Consultants and Registrars who are all trainees in emergency medicine and we also have some SHO's who many of those are trainees in emergency medicine or have an interest in sporting sports medicine" (Doctor 1). "We put out a general email to staff to see interest- but really you need to be triage competent as we all had to manage patients as they came in – doctors and nurses" (Nurse 3). "It's not as strict as other events it's on at least both days we need at least half of them to be triage competent… We do take juniors but not as junior as a new grad, we will take RN what we call fours and threes" (Nurse 2). "I think you would need to have demonstrated the ability to identify a sick person visually, because everything is done as a first off assessment visually" (Nurse 8).
	Communication Pathways	"There's a controlled hierarchy with communication with the coordinator … so any of the commander control vertical line of transferred communication otherwise you'd have everyone calling the hospital" (Doctor 2). "But my understanding of the communication pathway is via (nurse coordinator) and the consultant that (were) on the ground" (Doctor 4). "It's nice to be in with everyone just chatting for a change" (Nurse 3). "I think communication has always been pretty good, it's not a big tent there's no walls or barriers so everyone's always just talking" (Nurse 7).
Physical Organizational Resources	Facilities	"It's a well pretty well practiced operation" (Nurse 2). "We basically cordoned off sections of the tent area to quarters to allocate teams for different areas so there was senior and junior mixed appropriately. We had a resuscitation zone that had someone senior allocated to it and senior management was more at the front for co-ordination and control" (Doctor 4). "Beds and chairs are all given by the organizers they're all there, we just set them all up " they give us the tent and they know exactly how many trestle tables and they are just trestle tables that they utilize for the beds. They know exactly how many fit in with the adequate space around them to work on people if we actually need to do a full-blown resus or anything like that" (Nurse 6).
	Equipment	"So, the equipment was yep the glucometer machine, the portable Welch Allen vitals machine, we had heaps of stock as far as I know down the complete left side of the tent pre- primed all IV Lines and IV fluid bags and stuff like that so that was all plentiful. It was just the simple monitoring equipment " didn't catch myself needing something that wasn't there" (Nurse 4). "Ice, band aids on blisters, Panadol, checking blood sugars" (Nurse 5). "We cannulated a few people and gave some fluids, some ECGs but most people just needed a lay down and bit of water and sugar then they were okay" (Nurse 7). "For the ninety five percent of it you didn't need much at all, you know basically fluid, sugar, lollies, chocolate, glucose supplies for majority of the patients… and we had originally set up for a resuscitation area if we needed it. But enough to provide basic life support, ventilate a patient, defibrillate a patient, paralyze a patient and put them to sleep and send them in an ambulance if we needed to" (Doctor 3).

Table 2. Structures of the Gold Coast Airport Marathon In-Event Health Care Service *(continued)*

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Structure	Example of Structure	Quote Reflecting an Example of Structure
		"[We] have packs ready or you know things that you might do in other situations…" (Nurse 3).
	Location	"We have to get in early as the main road is blocked by runners for ages" (Nurse 2). "We had nurses allocated to different locations in the tent – but it was pretty fluid. People pretty much went where people needed help" (Doctor 2).
	Funding	"Funding is sorted by hospital administration" (Doctor 2).
Social Organizational Resources	Clinical Staff Organization: Roles and Responsibilities	"It's not like being in the Resus room here where everyone knows where the basic equipment is and where to grab it. Nobody, even people setting up the tent on Friday, nobody is completely familiar with everything in the tent and it's just that you've got to be constantly on your toes" (Nurse 4). "We all just pitched in an everyone did everything – Doctors did obs and we shared our ideas about what was going on with patients" (Nurse 5). "[Senior nurse] obviously orientated us to the medical tent, um basically gave us a running order of how the whole day was going to go….so that was easy like we all knew what we were doing and we all knew our roles" (Nurse 6). "We brief nursing staff – but it's all pretty flexible – demand-driven" (Nurse 3). "If it's an incident to do with health if it's something that's going to impact hospital …. I will escalate that to back here to the hospital" (Doctor 1). "Role is different, rather than exhaustive interventions provided at a hospital.…So knowing when you have to stop and move on with people transitioning out of the tent was the key… two things is like length of stay in the tent and two is the amount of surge in terms of the amount basically that's coming through… and so making that decision sometimes there's a little bit of emphasis and senior experience to help the junior staff" (Doctor 3).
	Administrative Support	"Admin scanned people [race bib markers] and, I think, kept notes for the main EDIS [emergency department information system]" (Nurse 7). "It helps in a lot of ways for staff to be familiar with what's in it so if we did have to take them out in a mass casualty incident or a disaster type of incident that people know what's in them, they don't know where to find them in or what's in them but they're in there and in the briefing" (Nurse 1). "There's a controlled hierarchy with communication with the coordinator and through that way. The same point if we transferred a patient, we'd let them know and also debrief the QAS as well so you get a one to one hand over" (Nurse 1). "If there's been an incident down there where a staff member has been hurt or I'm concerned about staffing or anything I will escalate that to back ….to the bed manager the incident control of any emergency problems. If its big thing then they can get onto executive on call" (Doctor 3). "The admin staff were supposed to scan patient race bibs with iPads to track the patients" (Doctor 4).
	Patient Delivery/Flow	"Being at triage especially on the Sunday like it really does impact you if you don't know what's coming in" (Nurse 5). "Sometimes they would just come to the tent and say, 'I've got a sore ankle I just want some ice, I don't want to see a doctor, I don't want pain relief' you give them ice and that would be it like that was the extent of my role. Was pretty fast" (Nurse 6). "From the course we probably only send about four to the hospital per year is our average, remembering we don't see anyone who they collapse on course they don't come in to us they will get taken by ambulance directly to the hospital" (Doctor 3).
	Policies and Protocols	"Sent out an email previous like a procedures and protocol sort of document like a Queensland Health document" (Nurse 2). "We had bits of paper to write notes…. were transferred to EDIS" (Nurse 7).
Components Requiring Improvement	"Communication and setting the expectation of how the flow would actually function" (Doctor 3). "The expectation was that QAS should probably have called us" (Doctor 1). "Certainly, if it's someone new coming into the role, the education would be the handing over of that information, we should have procedures in place rather than just procedures in our heads. I learnt that from [previous senior nurse]" (Nurse 1). "The admin staff were supposed to scan patient race bibs with iPads to track the patients" (Nurse 8).	

Table 2 *(continued)*. Structures of the Gold Coast Airport Marathon In-Event Health Care Service

Note: "Structures" describe the characteristics of the staff and setting in which the health care was provided that might affect clinicians' capacity to engage in their role functions.[25,26]

Abbreviations: ECG, electrocardiogram; EDIS, emergency department information system; IV, intravenous; QAS, Queensland Ambulance Service; RN, registered nurse.

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Process	Example of Process	Quotes Reflecting an Example of Process
Independent Care (Assessment/Education)	Triage/Initial Assessment	"It was pretty much a modified emergency assessment in that it was presenting complaint and then targeted examination and treatment as required" (Doctor 4). "You could actually streamline it a lot better because they are quite similar presentations because the nature of what they're doing and you know the human body react quite similarly" (Nurse 8).
Directed Care (by More Senior Clinician)	Patient Assessment	"It's a great chance to give …. [less experienced medical staff] experience of assessment without all the bells and whistles we have in the main ED" (Doctor 1). "XX [senior nurse] has done it loads of times so she told us what to expect and what to do in case" (Nurse 8).
Interdependent Care with Overlapping/ Mutually Supportive Scope of Practice (Requiring Team Engagement and Coordination of Care)	Patient Care and Care Coordination	"It was a very level playing field in whoever was there took the patients so there wasn't, so there wasn't any evidence of seniority, probably there might have been if there had been more serous presentations" (Nurse 4). "There was no like ok you two nurses take these six tables and this is your equipment it was just a bit of a free for all which made it a bit harder, but you know I suppose you're not dealing with super acute unwell people so that fifty meters down the other side of the tent is not too bad" (Nurse 7). "We all muck in and help out – it makes it fun" (Doctor 2). "It was almost like doctors lost their roles and nurses lost their roles and we all worked together well……working a lot more holistically with the doctors..." (Nurse 6). "The team at the finish line would put collapsed runners on a wheelchair and wheel them directly to us" (Nurse 1).
Interdependent Site Care	Patient Transfers Including Referral Processes	"I think if we didn't have the tent, we'd probably have about fifteen to twenty more ambulances coming to hospital, so we're able to assess and treat and people got better spontaneously without being brought to hospital by ambulance… Providing good quality care at the scene may have had a downstream effect as well beyond the fiscal measures that we didn't have" (Doctor 1). "And for the patients its care and provision it's so much better having that available care at the scene so people didn't deteriorate, they got all the right treatment initially the basic stuff and didn't have to go to hospital. So, I don't know if it was significant; I don't know how you measure it" (Doctor 3). "I think it impacts on the potential work load … I think it takes a massive load off the ED and Queensland Ambulance by seeing and treating all the minor things that don't need a great deal of intervention" (Doctor 4). "I think we've got good cohesion between pre-hospital QAS, um we've got good cohesion between them and the emergency department. I think it's a really sensible way of doing things" (Nurse 3).
Perceived Benefits and Opportunities of In-Event Health Care Delivery	Participant Perceptions	"What I guess is hard to predict is how many of those patients that we see there that would end up coming to the hospital and that's hard to predict but I think we would certainly if you look at typically the Sunday where we see anywhere from a hundred to a hundred and fifty, probably you could say that twenty to thirty would definitely go to hospital if the medical tent wasn't there" (Doctor 2). "I think it's really important that research continues down there because by having research conducted ensured that what we do with taking the hospital out of the walls is verified" (Doctor 3). "I was on a day shift [in the main ED on first event day] and it was no busier, I remember making the comment it was less busy than what we thought it was going to be with the

Table 3. Processes Contributing to the Gold Coast Airport Marathon In-Event Health Care Service *(continued)*

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Process	Example of Process	Quotes Reflecting an Example of Process
		marathon on… I remember the QAS ramping wasn't that bad" (Nurse 5). "It does make … a great impact on the emergency department in our district" (Nurse 1). "I think it's just nice to have a collegiate environment away from the work place…I think its good publicity beside everything else, like it's good to have the hospital emergency department out there amongst the community" (Nurse 7).
Processes Requiring Improvement	Participant Perceptions	"It takes resources from staff and for the continual or longevity it needs to be appropriately funded" (Doctor 3). "I think wooden tables are a bad idea for it I didn't like that. I think plastic just seems better. You know not wooden like when its varnished and that varnish wears down then there's like cracks in the wood and moisture can seep in that's probably like the only thing, I was like we could've done that better" (Nurse 7). "You'd turn around and looks for a BSL or you'd look for a tympanic and they'd all just weren't there like so I found a lot of time was wasted running up and down the tent trying to find stuff" (Nurse 8).

Table 3 *(continued)*. Processes Contributing to the Gold Coast Airport Marathon In-Event Health Care Service
Note: Processes describe the role functions and responsibilities of the staff in which the health care was provided.[25,26]
Abbreviations: ED, emergency department; QAS, Queensland Ambulance Service.

Interview data revealed that no specific nursing or medical skill sets were required, although few, if any, inexperienced staff were selected unless they had a personal interest in sports medicine and care. Staffing allowed for capacity building where those with limited or no in-event experience were offered the opportunity to work in the setting along slide other experienced staff (capacity building). It also ensured adequate staffing at the main EDs. Interview participants consistently stated the need for fair and demand-dependent human resource sharing between the hospital EDs and the in-event heath care service.

Other Human Resources Support—Participants reported that the Gold Coast Marathon organizers reportedly provided daytime and overnight security so that equipment could be left on-site overnight. Gold Coast Marathon organizers also coordinated trained volunteers to assist physical patient retrieval from the track.

Organizational Structures

Organizational structures of the in-event health care model were considered in terms of physical and social organizational structures. With regards to the *physical organizational structures*, these included equipment (material resources), facilities, location, funding, and resource documents.

Physical Organizational Structures

Material Resources—The health service contributed material resources, including equipment such as assessment devices, thermometers, sphygmomanometers, 12-lead electrocardiograms (ECGs), and medications such as intravenous (IV) fluids. They also contributed other consumable health care resources, such as bandages and icepacks, while event organizers contributed physical space and basic physical setup (ie, tent, eight plastic patient chairs, and 12 stretcher/tables). The event organizers resources included shortwave radios for in-event communication, including with QAS and first aid providers. Staff provided their own mobile phones for communication with the main hospitals. Electronic devices, such as iPad scanners (Apple; Cupertino, California USA) to register participants attending the event and track participants, supported effective communication.

Facilities, Location, Funding, and Supporting Documentation—Organizational structures were provided to meet both anticipated patient service demand and anticipated care requirements for the event-induced physiological complaints (based on previous experiences). The in-event marathon health care facility (marathon health tent) was a 10mx22m tent with on-site power (as described in the quotes in Table 2). The facilities internal design was structured to enhance patient flow, with clearly delineated areas for patient registration, treatment of minor injuries (chairs at the entry/triage point), and stretchers around the tent internal circumference to care for additional patients. Eight patient chairs were clustered around the entry/triage point and 12 stretchers were zoned into the four quarters of the tent. Central tables housed assessment and treatment equipment to allow ease of access.

Medical and administrative equipment was driven to the site from the local EDs and was often part of the recycling/updating/reviewing of the health services' disaster response equipment and consumables. The organizational equipment provided was sufficient to enable provision of a wide range of on-site clinical care, from minor injuries to high-acuity resuscitation care. Equipment was required to enable a range of clinical assessments such as vital signs (blood pressure, temperature, blood-oxygen saturation, and blood sugar levels) and ECGs.

Organizational structures, including lists of material and staff resourcing, were set out in a briefing document provided to clinical

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and administrative staff approximately two weeks prior to the event. This briefing document described the in-event resources available, the in-event tent location, access and egress points, and patient flow processes. Organizational structures were also outlined to in-event health care facility staff via verbal orientation at the start of each shift.

Social Organizational Structures

Clinical, patient transport, and administrative roles were described in many ways, with apparently overlapping and shared responsibilities for transportation, patient care, and administrative components of care delivery. There was a clear role for senior staff, particularly doctors, to initiate and maintain communication, predominantly with the hospital EDs. An in-event nursing leader originally set in place (in consultation with two lead medical consultants), and then described the organizational social structures. These organizational social structures were explained to staff at the start of each shift. Clinical seniority was de-emphasized, but clear routes of communication and resource sharing were reinforced.

While most clinical staff interviewed were typically aware of material and human resourcing, they rarely commented on organizational resources such as funding models or locational constraints. Staff generally commented very positively on the flexibility in organizational social structures, indicating that this made the work more informal and fun, as well as enabling some staff to be clinically challenged.

Processes

Processes of in-event health care included the processes around selecting clinical staff, clinician's treatment of recipients, patient flow through the facility (ingress, allocation, assessment, treatment, discharge, or transfer), and communications around and supporting all these processes. Staffing selection processes included circulation of a staff email, requests for staff nominations, and then a process of team development. Staff allocated to the in-event facility were balanced off the need for experienced clinicians in the main EDs and against the need for experiential development of staff and succession planning for organization and operation of in-event health care delivery. The processes of staff selection considered the relative needs and demands of in-event health care delivery compared to the demands for provision of health care by hospital emergency staff in the main EDs. Consideration of the equity of these processes was highlighted by senior staff (Table 3). Once staff were selected and approved, staff were provided with a short, pre-service briefing and an on-site orientation.

Clinical processes were considered in terms of independent, directed, and inter-dependent care and are set out in Table 3, together with exemplar comments from interview participants. While clinical scope for doctors and nurses did not change based on whether they were working in the main EDs or the in-event health care facility, there was limited clinician-specific independent care. During an average shift in the in-event health care facility, nurses and doctors undertook many similar clinical processes for patients, including triaging, allocation to specific regions in the tent, initial assessments, administration of simple treatments (ice, oral fluids, or sugar supplements), and the provision of discharge information. This was noted as a departure from usual practice in which there was often distinct role separation; for example, in EDs, triaging is typically seen to be a nursing responsibility, while provision of discharge information might be recognized as medical responsibility. Some roles were distinct to specific clinical entities. For example, care escalation to the main EDs was primarily coordinated by medical staff, while liaison between other health staff (QAS and first aid) and staff in the in-event health care facility was undertaken primarily by the senior nurse.

Inter-dependent care between the in-event clinical staff and other health care providers was also evident. For example, a doctor stationed at the event finish line (supported by first aid and clinical staff) would provide preliminary triage in collaboration with first aid and nursing staff. Referral to the in-event health care facility was undertaken by both nurses and doctors, often working in concert. Around the course, QAS and/or first aid staff were stationed at various locations to provide initial care and transport to the in-event health care facility or the hospital ED. Patient acuity, rather than location, was the primary driver for transport destination.

All interviewees reported that the model was operational because of multi-disciplinary and inter-agency collaboration between QAS, St John's Ambulance, nurses and doctors, and event staff. Interviewees also clearly enunciated clinical goals set around reducing patient transport to the hospital EDs, managing patients wherever possible on-site, and providing a valued community service.

Interviewees reported that they could provide the kinds and levels of patient care they expected in this context, ensuring immediate patient comfort and safety. Despite the apparent satisfaction with relative clinical independence, both groups of clinical staff described a shared team approach to care provision in which positively engaged clinicians supported and enhanced care delivery.

Communication

Communication in the marathon health tent was relatively informal. The small size of the in-event health care facility, the short distances (meters) across which staff needed to communicate, and the open casual setting in the marathon health tent enabled direct person-to-person, multi-disciplinary, professional and informal (social) communication.

A clearly defined process for communication, established by the senior doctors working at the in-event, acute health care facility, involved pre-defined lines of consultation between staff working within the in-event health care facility and staff located around the course and in hospital EDs. This contact exclusively utilized mobile phones direct to clinical contact numbers in the EDs (consultant direct to ED consultant or ED shift coordinator). The nursing cohort recognized these "medical" communication processes, but viewed their own communication styles as more casual, especially when compared to their normal role within the ED, and primarily focused within the in-event health care facility.

Communication between the in-event health care facility and the QAS and on-site first responders was via radio contact. If a patient was to be transferred to the main ED directly via QAS, the usual communication protocols were observed. If the patient attended the in-event, acute health care facility and was then to be transferred, the senior medical consultant in the in-event, acute health care facility phoned the medical team leader at the ED to provide direct notification and an initial handover. The formal (written) records pertaining to the patient were provided primarily by transporting QAS paramedics with addendums from nursing and medical staff in the in-event, acute health care facility.

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Occasional communication or organizational failures between the triage staff at the main EDs and ambulance or in-event, acute health care facility staff resulted in hospital ED triage nursing staff reporting that they sometimes felt unable to prepare for anticipated increased presentations (Table 3). Staff working at the local EDs identified less well-defined or consistent policies and protocols for communication across health care sites, set within a context of increased preload and patient demand on the ED, created by the Gold Coast Marathon event in addition to normal expected ambulance patient load.

Perceived Benefits and Opportunities of In-Event Health Care Delivery

In addition to structure/process elements identified, staff managing patient flow at the ED and staff in coordinating roles at the in-event health care facility reported that hospital avoidance was an important consideration of the in-event, acute health care facility. The in-event health care facility was identified by staff at both sites (in-event and main EDs) as a positive contribution to patient flow in the main EDs and to the broader community. In-event staff also perceived participating in health care delivery at the marathon tent as having positive social aspects, providing an opportunity to encourage/enhance positive community perceptions about the local EDs. They also valued it as an alternative working experience. Examples of such comments are included in Table 3.

Opportunities for Service Improvement

Very few opportunities for service improvement were reported by staff. Some staff indicated that inter-service (QAS/other clinical staff) communication could be strengthened to ensure that all prehospital staff were equally aware of the medical scope available in the in-event facility. They also highlighted additional/improved equipment (such as mobile radiology and ultrasound scans) that might assist care delivery. Such equipment could enable in-event staff to provide more in-event assessment, and thus, a greater capacity for either directly discharging patients or a more complete handover on transport to the main EDs. Equipment location (finding things on the long, central equipment benches) was sometimes challenging, but generally staff perception was that the care model worked well. Some concerns around the funding model used (mostly regarding lack of understanding) were raised by senior staff, primarily around the costs to the local health care service budget.

Discussion

The number of mass-gathering sporting events continues to grow both within Australia and internationally.[19,37] This growth requires careful consideration as to how best provide health care to support athletes and onlookers, while minimizing the impacts on local EDs and the community. The Gold Coast Marathon was a sporting mass gathering where the delivery of in-event health care provided an opportunity to describe the structures and processes of this model. Broadly speaking, staff operating from the in-event facility and the main EDs reported positively on the structures and the processes in operation.

While many events, sporting and other, offer in-event health care, few offer such a breadth of both clinically experienced and senior staff operating within a wide scope of intervention. Many in-event health care services are operated by volunteers,[2,3,6,14] despite calls for evidence-based guidelines and published data to support medical planning for marathon races.[21,24,38,39] Indeed, current evidence suggests that workforce planning for mass gatherings is often a very inexact science.[40] It is not unusual for mass gatherings to provide on-site medical, as well as nursing and first aid, clinical support.[16,17,19,41,42] The provision of such support can reportedly result in high-quality, timely care, effectively screening patients in-event and reduced transfers to, and thus demands on, local EDs.[9,19,21,43] Despite models of in-event patient presentation and transportation rates for a range of mass-gathering events,[39,44,45] and evidence of impacts of mass gatherings on health service care provision,[8,21,46] there are relatively few systematic and detailed descriptions of delivery of in-event care.

The data collected in this study suggested that medical and nursing staff perceive they have a good understanding of the resources available and the limitations of in-event health care provision, acknowledging in their responses that most of their health care delivery was affiliated with minor and event-induced physiological complaints. Clinicians indicated that the resources available to perform their roles were well-aligned with the health care needs of patients. In its primary capacity, the in-event, acute health care facility was apparently resourced to deliver health care to varied minor injuries and event-specific induced physiological complaints. Staff, however, expressed satisfaction with the in-event resources which were sufficient to enable them to expand functions so as to operate as a single event prehospital resuscitation space, if a situation arose that required levels of intensive/emergency care. This appeared to have evolved from staff experience, rather than from published evidence.

The equipment and environment enabled delivery of an effective health service within an efficient operational patient flow system. Well-defined routes of clinical communication assisted with service delivery, and the importance of inter-service communication was clear. The marathon health tent service has the added advantage of provision of facilities and even rehearsal/equipment check for mass-casualty events, ensuring that staff were familiar with the content and layout of the basic disaster response equipment. Indeed, the clinical aegis under which the facility is operationalized is the disaster response and management banner.

The in-event health care facility offered incidental benefits to staff. These included reports of improved ease of communication, perceptions of enhanced team work, staff satisfaction, and opportunities to test the use of their skills in an out-of-hospital setting. Staff reported satisfaction with the notion of offering a valuable community service.

Limitations

Limitations identified using this research design and enquiry process include, as with most qualitative work, the use of non-random sampling strategies of purposeful and snowball sampling with the accompanying risks of small sampling bias. However, the sampling strategy used is considered a stronger option than availability or convenience sampling,[47] and data saturation was achieved within data collected from two groups of clinicians.[30] The study was undertaken at one site, focusing on one type of mass gathering (sport), limiting the transferability of findings to other sites or types of mass-gathering events. Additionally, this study evaluated a care provision model staffed primarily by ED nurses and doctors. Other models of care staffed with a different skill set may have different findings.

Conclusion

Findings from this study highlight key structures of the in-event health care facility included equipment, security, space and skill-mix, and processes such as communication and referral pathways.

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These were important components for the delivery of emergency care in the out-of-hospital setting. There was a perception of shared and united treatment goals by clinical staff, and a team approach to meet process aims. Recommendations for future research include considering the health patients' experiences of services provided.

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