The activities and impacts of a community-based volunteer ambulance service in Cape Town, South Africa

Charmaine Cunningham*, Matthew Rosenberg, Jurgen Kahle

Department of Surgery, Division of Emergency Medicine, University of Cape Town, Cape Town, South Africa

ABSTRACT

Introduction: Volunteering yields valuable benefits to communities, yet globally there is limited published data regarding emergency medical volunteering in communities. Hout Bay Volunteer Emergency Medical Service is thought to be the oldest volunteer ambulance service in Cape Town. The objective of this paper is to quantify the contribution of the community service to the Western Cape Government Health: Emergency Medical Service. This paper describes the inputs, key stakeholder relationships, and the impact of COVID-19 on volunteer input and community needs.

Methods: Electronic Computer-Aided Dispatch records were used for analysis. Data extracted included detailed information about all recorded incidents between 1 January 2015 to 31 December 2020. Data were analysed in Google Sheets using Pivot Tables and summary statistics.

Results: Between 2015 and 2020 HBVEMS responded to approximately 12% of all call-outs in the Hout Bay area, which equates to 2187.16 h of operational time spent on calls. This excludes standby time, i.e., time spent waiting to be dispatched. There was an expected noticeable difference between response times for ambulances based within Hout Bay, and those from outside Hout Bay. Despite a decline in average call-out rate during the 2020 Level 5 lockdown, the volunteers were able to do more shifts and thus more calls within the community. Call-outs during 2020 were visualised as a ratio of trauma to medical calls. In this period there were noticeably fewer trauma calls.

Conclusions: There is a growing need for emergency medical care, and volunteer ambulance services can have a meaningful impact on the continent. The findings support the benefit of developing community-based ambulance services, especially in areas that are remote due to distance or topography. The model can be expanded to other communities across the continent. A key factor for success is actively managing stakeholder relationships which include community-based relationships as well as governmental or formal emergency medical services relationships.

African relevance

- Demonstrates how a volunteer grassroots community project can contribute to supporting formal emergency medical services
- Interface between government and NGO/volunteer services are important to rendering EMS care
- HBVEMS model can inform other EMS services in South Africa and rest of Africa

Introduction

Volunteering has been widely described as yielding valuable benefits to communities. It is known that various volunteer Emergency Medical Service (EMS) groups exist in South Africa, but there are few published reports about how they function and what services they offer [1].

Hout Bay Volunteer Emergency Medical Service (HBVEMS) is thought to be the oldest volunteer ambulance service in Cape Town [1]. It was started in 1994 by a group of residents that were concerned with the response times to medical emergencies within Hout Bay. Despite the relatively short distance to 24 h emergency medical facilities and formal EMS bases, responses were and still are delayed due to the mountainous topography (Fig. 1). It was argued that developing a community response system within Hout Bay would result in shorter response times and consequently improved patient outcomes [2].

Hout Bay is a suburb of the city of Cape Town within the Republic of South Africa. It lies approximately 20 km south from the Central Business District of Cape Town, on the Western coastline of the Cape Peninsula. As mentioned above, despite its apparent close proximity to EMS and healthcare facilities, Hout Bay is physically isolated as it is enclosed on three sides by mountains, and by the coastline on the fourth.
side (Fig. 1). Access and egress into Hout Bay are restricted to three two-lane roads via the mountains. This causes delays in medical emergency response times which is further hindered during times of high traffic flow, e.g., peak traffic or tourist season and adverse weather conditions.

Hout Bay has been recorded as covering 32.3 km² and in the 2011 census, the official population was recorded as approximately 33,000 people [3,4]. The umbrella term ‘Hout Bay’ describe three sections, namely Hout Bay, Hangberg and Imizamo Yethu. These sections are separated by socioeconomic conditions that cover the segregated spectrum of harsh disparities between those living in abject poverty (no bulk water, sewerage, or electricity) and those for whom cost is not a barrier to access housing, healthcare, and other luxuries.

Of the three, Imizamo Yethu is the largest, making up about 40% of the total Hout Bay community. It is a particularly dense section, consisting mostly of informal dwellings, with an approximate population density of 27227 persons/km² living within its 57 hectares [5]. Hangberg makes up the smallest section and is set against the slope of Karbonkelberg on the opposite side of Hout Bay and consists of row houses, council flats, and informal dwellings. Both are indicated in red in Fig. 1 and are on the opposite sides of Hout Bay. The section between the two areas, commonly referred to as The Valley, is the most affluent and comprises of formal housing. HBVEMS predominantly responds to emergency calls within Imizamo Yethu and Hangberg.

Patients transported by HBVEMS are typically transported to the nearest state District Hospital that can manage seriously ill and injured patients (Victoria Hospital), which is 12 km away. Less serious patients are transported to the Retreat Community Health Centre (17 km away). Patients who require specialist care are transported to the nearest Tertiary facility (Groote Schuur Hospital) which is 18 km away (Fig. 1).

HBVEMS originated from an identified community concern and need. Since its inception, the original need has continued as there are still no 24/7 hospitals or emergency centres in Hout Bay, and when HBVEMS is not operational, ambulance services respond from outside of Hout Bay. In the more than 25 years of its existence, HBVEMS has continued to support the community in various ways, including interaction with community leaders in all three areas, rendering first aid training and, most recently facilitating fire prevention training for residents of Imizamo Yethu and Hangberg. HBVEMS also provides medical support at community events such as sports events and awareness and orientation at schools.

HBVEMS is a volunteer organisation, and not only do members not receive remuneration for hours worked, but they also cover the costs of their paramedic training and annual registration fees with the national governing body. Patients are not held financially liable by HBVEMS, and the service relies on the goodwill of community members and sponsorships from organisations. At the conception of HBVEMS members responded to emergencies in private vehicles. Later the service received an ambulance on loan from the provincial EMS. With funding, HBVEMS was able to purchase a community-sponsored ambulance [1]. The service and ambulance are maintained via donations from the community and local businesses within Hout Bay. Consumables are supplied by the Western Cape Government Health: Emergency Medical Services (WCGH: EMS) and the relationship between the two organisations has been and continues to be, paramount to the success and sustainability of the service.

The WCGH: EMS is an important stakeholder, and HBVEMS is integrated with the WCGH: EMS via a service level agreement (SLA), and calls originate from the provincial ambulance control room. WCGH does not participate in daily clinical governance, quality control or the management of the service; it provides periodic oversight functions and is available for consultation. The priority of calls is determined by the information received by the call taker. There are two broad categories: priority 1 calls are those that are life threatening, whilst priority 2 calls have been classified as less urgent and non-life-threatening. It is a performance indicator for the WCGH: EMS to meet a target time of an ambulance arriving on scene within 15 min for priority 1 calls [7]. For HBVEMS it is important to meet the target times as part of the SLA, but also because it underscores the purpose of having a community-based ambulance service.

Due to its voluntary nature, HBVEMS mostly operates after hours when the volunteers are free from their daily careers. A key question this paper explores is whether the limited hours that HBVEMS is operational has a measurable impact in supporting the community and WCGH: EMS. This is an appropriate time to explore this question within
a South African context. Historically the pool of HBVEMS volunteers has been made up of short course paramedics. Changes to the paramedic legislation in the last decade has caused the cancellation of these short courses. It is assumed and supported by anecdotal data on newcomers to the service, that this change in legislation has adversely impacted the dwindling volunteer numbers [2].

Another question that is addressed in this paper pertains to COVID-19 and whether the needs, types of calls, and volunteer willingness to work shifts changed during 2020. At the end of March 2020, the South African Government implemented measures aimed at limiting the spread of COVID-19. Five lockdown levels were set, with Level 5 entailing the most drastic measures with an absolute ban on alcohol, a curfew, and restricted travel. Tertiary hospital-based data in the Western Cape has shown a decrease in hospitalisation of trauma cases during Level 5 lockdown with the numbers returning to pre-lockdown immediately after [8].

Methods

Electronic Computer-Aided Dispatch records were used for analysis. Permission to use the data was given by the Medical Director WCGH: EMS. Data were extracted by a WCGH: EMS representative and sent to the HBVEMS team, including all recorded incidents for 1 January 2015 to 31 December 2020. The data provided included extensive information, including the reason for case completion, shift (day/night), case type, priority of call, incident type, response times, and which vehicle was dispatched to each incident. No patient identifiable information was provided, and access was restricted to the authors.

The data pertained to information of calls in Hout Bay, which includes the three areas of Hout Bay, Imizamo Yethu, and Hangberg, for both the HBVEMS volunteer ambulance as well as all other provincial EMS ambulances for the time period mentioned above. In addition, data was provided for all calls completed by the HBVEMS volunteer ambulances which included calls outside the Hout Bay area. The data provided call distribution for the suburb of Hout Bay and did not make a clear distinction between the three areas within the suburb.

The data was analysed in Google Sheets using Pivot Tables and summary statistics. Mapping was conducted using the publicly available Google Earth Software with annotations added in Microsoft PowerPoint. Suburb geographical data was obtained from the City of Cape Town’s public repository. No ethical approval was required.

Results

There is a noticeable difference in the response times between the HBVEMS ambulance and WCGH: EMS ambulances, with HBVEMS having a faster average response time when compared to the WCGH: EMS (Fig. 2). In the five years (2015 - 2020) HBVEMS has responded to approximately 12% of all incidents in the Hout Bay area, which equates to 2187.16 h of operational time spent on calls. This excludes standby time, i.e., time spent waiting to be dispatched.

On request from the WCGH: EMS control room, HBVEMS responds to other suburbs, especially when there is not an available WCGH: EMS vehicles closer to respond to priority 1 calls. This makes up approximately 30% of the total ambulance workload (Table 1). HBVEMS then responds over the mountain to areas including Lotus River, Lavender Hill, Capricorn, and Wynberg.

There was a decline in the average workload of the WCGH: EMS during lockdown Level 5 and the decrease continued throughout the remainder of 2020 (Fig. 3). Even though it increased from the Level 5 lockdown period, numbers remained lower than the previous years. In contrast to this, the introduction of the lockdown levels saw an increase in the percentage of total calls which were attended to by HBVEMS. The above-average contribution by HBVEMS continued throughout Level 5 and 4, before decreasing to below-average levels for the remainder of the year.

The ratio of trauma to medical calls registered in Hout Bay demonstrates an average ratio of 0.45 (with some monthly variation) for the pre-pandemic years of 2015 – 2019. Overall, in 2020 the average ratio was 0.39, but this varied considerably between 0.59 and 0.23. From March to May 2020 (lockdown Levels 5 and 4) there was a noticeable decrease in the proportion of trauma versus medical cases. From June onwards Hout Bay experienced an increase in the ratio, but except for October, it was still less than the pre-pandemic monthly average (Fig. 4).

Discussion

The contributions of HBVEMS to the community and WCGH: EMS are tangible and the vision for which HBVEMS was conceptualised continues to underpin the service. HBVEMS was formed because of a concern regarding response times to medical emergencies within the community. Prolonged response times are thought to contribute to higher mortality rates and the measurement of response times are a key performance indicator of the WCGH: EMS. Because HBVEMS predominantly attends to calls within the community it serves, the response times, especially to emergencies (priority 1 calls) remain within the WCGH: EMS key performance target. The difference between HBVEMS that typically responds within Hout Bay, and WCGH: EMS that typically responds from outside Hout Bay, can be seen in the 42.3% faster response of HBVEMS (Fig. 2). Anecdotally other reasons for the faster response times may include tacit knowledge of the roads, especially in Imizamo Yethu and Hangberg where roads and houses are not well addressed, as well as the existing relationships with the neighbourhood watch and local leaders. The shorter response times is a testament to the benefit of developing community-based response systems, especially in remote areas, regardless of this being due to distance or topography.

Another way in which HBVEMS contributes to the WCGH: EMS is that when actively in service, the HBVEMS ambulance alleviates the pressure on the WCGH: EMS by freeing up resources for the WCG: EMS ambulances to respond to other incidents. There is an additional safety aspect, as the response over the mountain can be treacherous. Despite HBVEMS only working over weekends, in 2015–2020 the service responded to 12% of all incidents in the Hout Bay area (Fig. 2), as well as a proportion of calls outside of Hout Bay when requested by WCGH: EMS (Table 1). This is assumed to be a meaningful contribution to the caseload of the strained WCGH: EMS.

As expected, COVID-19 had an impact on the call-out rates, with a decline in the average call-out rate and the number of trauma cases (Figs. 3 and 4). HBVEMS was able to do more shifts and attend to more calls during this time, due in part to the volunteers’ increased availability (due to changed work situations) as well as a desire amongst the members to make a difference during an unprecedented time in healthcare. Although the WCGH: EMS call-out rates also declined in Hout Bay during this time, WCGH: EMS had an instrumental role in COVID-19 responses by performing inter-facility transfers between health facilities and COVID-19 field hospitals. Thus, during this time HBVEMS was not

| Suburb         | % of call volume |
|----------------|------------------|
| Hout Bay       | 69.69            |
| Lotus River    | 2.48             |
| Lavender Hill  | 2.40             |
| Capricorn      | 1.81             |
| Wynberg        | 1.68             |
| Grassy Park    | 1.52             |
| Retreat        | 1.46             |
| Parkwood       | 1.42             |
| Steenberg      | 1.28             |
| Plumstead      | 1.25             |
| Constantia     | 1.09             |
| Ottery         | 1.07             |
Fig. 2. Comparison of response times for WCGH: EM ambulances and the HBVEMS ambulance.

Fig. 3. The effect of the pandemic lockdown levels on call volumes in Hout Bay.
only able to support the community more, but the support to WCGH: EMS increased too.

The existence of HBVEMS is dependent on the relationships with its stakeholders i.e., interest groups or organisations with the power to influence the daily operations of HBVEMS, and with the power to ensure the continuity and funding of the service. The three main stakeholders are the community served, WCGH: EMS and donors. There are competing interests between the WCGH: EMS and donors that require careful manoeuvring. The donors, including community members and local businesses, want to see their investment rendering care within the community whereas the WCGH: EMS at times requests support outside of Hout Bay (Table 1). HBVEMS does respond to other suburbs when required for priority 1 calls, and it makes up approximately 30% of the total ambulance workload. This percentage is low enough for the donors not to complain while demonstrating support to the WCGH: EMS. HBVEMS manages donor relationships by regularly contributing to community activities and community enhancement projects for example the fire prevention training. Actively managing the community, donor and WCGH: EMS relationships is important to those considering volunteer or community ambulance services, as the longevity of HBVEMS is in part due to actively managing the stakeholder relationships and expectations.

The change in paramedic legislation in the past decade poses a threat to HBVEMS and other volunteer services that rely on short course EMS practitioners to join the service. Historically the short course training programmes regularly produced recruits for the service with potential volunteers being able to study for as little as 5 weeks before volunteering. The majority of the volunteers have full-time employment external to emergency care, and this relatively low barrier to entry allowed them to become involved. Paramedics that hold a degree are more likely to be in full-time employment within emergency care and the longer training courses (the minimum being one year’s full-time study) present a significant barrier to gaining new volunteers. Anecdotally there have been fewer new paramedics joining the service since the change in paramedic legislation. The impact of the discontinuation of short courses on the sustainability of volunteer organisations should

Fig. 4. Comparing the difference in trauma and medical calls and the effect of the pandemic and lockdown levels.
be considered by policy-makers to ensure the sustainability of volunteer organisations and the contributions made by such organisations. This could include strategies such as allowing students to work on volunteer services as part of clinical rotation, alternative and realistic training options, close integration with the full-time state EMS organisations, and arrangements that are mutually beneficial for both whilst staying patient-focused.

Limitations

There are several limitations to the paper. The data were provided by WCGH: EMS and could not be verified by the writers. Analysis was retrospective and the authors had to rely on the information received, whereas if it was prospective, specific data could have been captured. The authors’ knowledge is limited of any changes to the WCGH: EMS system during 2015–2020.

Conclusion

In many African countries, Emergency Medical Services remain in nascent stages, despite a growing need for emergency medical care. This study demonstrates the contribution of a volunteer ambulance service in a Western Cape setting which is often called a microcosm of South Africa. The findings suggest that volunteer ambulance services such as HBVEMS can have a meaningful impact on the continent. This is even more crucial when government EMS are further burdened by disasters such as the COVID-pandemic. A key factor to success is the active management of stakeholder relationships which includes community-based relationships, as well as governmental and formal EMS relationships. The HBVEMS model can be expanded to other communities across the continent.

Further studies on dispatch systems and investigation into the reasons for the increased response times across the system for 2015 - 2020 should be investigated. A prospective study considering call volumes for the different areas may be useful for the HBVEMS team. A broader study considering other volunteer services and their contributions across Africa could be beneficial. It could also be useful to consider how formal EMS view volunteer services.

Dissemination

Results of this manuscript will be shared with HBVEMS members, and with the Medical Director of Emergency Medical Services. It may be shared with funders as well.

Author contribution

Authors contributed as follows to the conception of the work: the acquisition and analysis of data, or revising it critically for important intellectual content: CC contributed 40%, MR 35%, JK 25%. All authors approved the version to be published and agreed to be accountable for all aspects of the work.

Declaration of Competing Interest

The authors declared no conflicts of interest.

References

[1] Kahle JW. A 12-month retrospective, descriptive study of Hout Bay Volunteer Emergency Medical Service, Cape Town, South Africa, Faculty of Health Sciences. Division of Emergency Medicine; 2019. [cited Sept 2]. Available from http://hdl.handle.net/11427/31424.
[2] Cunningham C. Sustainability of a Nonprofit Ambulance Service in Cape Town, South Africa. University of Sunderland; 2013. [Master’s Thesis].
[3] South Africa Census Report: Strategic development information and GIS department. City of Cape Town –2011 Census for Suburb Hout Bay. http://www.statssa.gov.za/?page_id=4286&id=332 [cited July 21, 2021].
[4] South Africa Census Report: Strategic Development Information and GIS Department. City of Cape Town –2011 Census for Suburb Imizamo Yethu. http://www.statssa.gov.za/?page_id=4286&id=333 [cited July 21, 2021].
[5] Kretzman S, Ward 74: Beautiful Valley with an ugly problem. GroundUp: Feature article. July 18, 2019. http://www.groundup.org.za/article/ward-74-valley-scarred-apartheid/ accessed 21/07/2021.
[6] Google Earth Pro, 2021, Hout Bay, Cape Town, 34°00′45.5″S, 18°02′19.4″E, 3D map, viewed 1 September 2021, http://www.google.com/earth/index.html.
[7] Western Cape Government Health Annual Report. Cape Town: government printers; 2019/20. p. 54. https://www.westerncape.gov.za/assets/annual_report_2019-2020.pdf, p54. (accessed September 05, 2021).
[8] Navaria PH, Nicol AJ, Parry CD, Matzopoulos R, Maqungo S, Gaudin R. The effect of lockdown on intentional and non-intentional injury during the COVID-19 pandemic in Cape Town, South Africa: a preliminary report. SAMJ, S Afr 2021;111(2):110–13 Feb 1.