

AUDIT OF BLOEMFONTEIN PRIMARY HEALTHCARE CLINICS' EMERGENCY PREPAREDNESS

Dirk T. Hagemeister

orcid.org/0000-0001-9442-3204
University of the Free State, South Africa
hagemeisterdt@ufs.ac.za

Molibeli Makhoathi

orcid.org/0000-0002-0070-5444
University of the Free State, South Africa

Lerato Sekhutsoanyane

orcid.org/0000-0003-0864-4241
University of the Free State, South Africa

Nqobile Dladla

orcid.org/0000-0003-4134-3969
University of the Free State, South Africa

Sinenhlanhla Mbongo

orcid.org/0000-0003-0866-4752
University of the Free State, South Africa

Siyabulela Seemi

orcid.org/0000-0002-0562-0394
University of the Free State, South Africa

Gina Joubert

orcid.org/0000-0002-3728-6925
University of the Free State, South Africa

ABSTRACT

Primary health clinic staff must be prepared to manage medical emergencies until an ambulance arrives. This study aimed to determine how well prepared clinics in Bloemfontein, South Africa, are to manage common emergencies regarding consumables, equipment and medication, secondarily to identify common emergencies. This was an observational descriptive study and included all 16 public primary health clinics in the Bloemfontein sub-district. Data were collected using a walk-through audit tool based on current provincial equipment lists. Mean compliance was 45 per cent (range 32–67%) for consumables, 53 per cent (range 46–63%) for equipment, and 58 per cent (range 36–77%) for medication. None of the clinics achieved a level of above 80 per cent in any of these three sub-categories. Six clinics (38%) scored below 40 per cent for consumables, one (6%) for equipment and two (13%) for medication. Items not found in any of the clinics were paediatric or neonatal

Magill forceps, size 6.5 cuffed and 4.5 uncuffed endotracheal tubes, and 14 g intravenous cannulas. Two clinics had an automated external defibrillator. Respiratory (asthma), metabolic (hypo- and hyperglycaemia) and cardio circulatory (hypertension) were the most common emergencies. Almost half of all the clinics scored less than 40 per cent in at least one of the three sub-categories, suggesting a general “poor culture” of maintaining emergency trolleys. The utilisation of an easy-to-use audit tool to monitor the emergency preparedness of clinics appears essential. Identified challenges with such a tool need to be dealt with and clear audit rules must accompany such a tool. Audit results should be used in the performance assessment of responsible managers.

Keywords: emergency treatment; primary care nursing; clinics; audit; equipment and supplies

African Relevance

- Nurse-driven primary healthcare services based in community clinics, are the backbone of healthcare delivery in many African countries.
- Quality assurance is a critical matter in assuring the sustainable roll-out of universal health coverage.
- Availability of medication, equipment and consumables is a weak point in many under-resourced African environments, especially so in rural and remote areas.
- These shortfalls often negatively influence the health outcomes of the most vulnerable populations (for example, children and pregnant women).

Introduction

Healthcare personnel in South Africa are obliged by the constitutional provision in Section 27(3) that “no one may be refused emergency medical treatment” (South Africa 1996). South Africa has engaged in the ambitious enterprise to progressively realise universal health coverage by means of the National Health Insurance. The essential role primary healthcare will play in this development has been re-emphasised in the recently published White Paper (NDOH 2017a). As healthcare facilities, private and public, will have to be accredited as standard compliant, new concepts and institutions have been developed in the last couple of years to facilitate and assess such compliance, including the Ideal Clinic Project (NDOH 2016) and the Office of Health Standards Compliance (Office of Health Standards Compliance n.d.).

When a medical emergency occurs, it is critical that healthcare personnel respond immediately. Clinics must be prepared and equipped to manage an emergency until additional resources, such as emergency medical services, arrive on the scene. Standard Treatment Guidelines and Essential Medication Lists published by the South African National Department of Health (NDOH 2014), provincial circulars prescribing the medication and equipment to be available at healthcare facilities (PPTC 2016), and

expert guidelines by clinical associations such as the Emergency Medicine Society of South Africa (EMSSA) provide guidance as to what needs to be available in a primary healthcare clinic (EMSSA 2008a; 2008b; 2008c).

Studies in South Africa have described gaps in the availability of emergency equipment and drugs in primary healthcare settings in Johannesburg (Thandrayen and Saloojee 2010) and rural KwaZulu-Natal (Dlamini 2004). An audit done by Adamson (2012) of eight 24-hour community health centres in the Western Cape revealed “considerable deficiencies of essential emergency items”. A survey by Botha and Kotze (2014) of both equipment and skills for emergency care in four radiology departments in hospitals in Bloemfontein described gross deficits among half the equipment and staff investigated, especially with regard to smaller, i.e. paediatric, sizes of equipment.

In 2015, the population of the Bloemfontein sub-district was estimated to be 544 000, with the size of the uninsured population, depending on the free provision of primary healthcare at public facilities, estimated at 457 000. This population was served by one district hospital, two community health centres, 16 fixed community clinics and seven mobile clinics (Mangaung Metropolitan Health District 2017). Community health centres are larger ambulatory facilities, operating 24-hours a day and typically having a resident medical doctor. Community clinics are smaller and clinical services are provided by primary healthcare trained registered nurses, supported by visiting medical practitioners (Daviaud and Subedar 2012).

Aim

The primary aim of this study was to determine the availability of consumables, equipment and medication for the management of common emergencies at primary healthcare clinics in the Bloemfontein sub-district, Mangaung Metro District. The secondary aim was to identify the most common medical emergencies seen at the clinics.

Methods

Study Design and Sample

This observational descriptive study was conducted at all 16 public primary healthcare clinics in the Bloemfontein sub-district of the Mangaung Metro from October 2016 to December 2016.

Materials and Methods

Data were collected at the clinics using a walk-through audit tool, which comprised 148 items: 71 items for consumables, 36 for equipment and 41 for medication needed in the treatment of common medical emergencies. The audit tool was compiled according

to recommendations from the emergency trolley provincial list from the Free State Department of Health (FSDOH) (PPTC 2016) and from the EMSSA (EMSSA 2008a; 2008b; 2008c). The types of common emergencies seen regularly at the clinics, as stated by the clinic staff, were also recorded.

The sister in charge of each clinic accompanied the researchers to the emergency trolley. Some of the medication, such as scheduled medication or medication that needed refrigeration, was kept in the pharmaceuticals storage area in the locker or fridge. According to the audit tool items, consumables, equipment and medication on the emergency trolley and in the special storage were checked and marked as present or absent. The amount of each item was recorded while the expiry dates of the consumables and medication present were also recorded.

Pilot Study

A pilot study was conducted in September 2016 on two emergency trolleys in clinical areas (the maternity ward and the casualty department) of a local community health centre. Based on the results of the pilot study, indicating a difference between a provincial circular and the EMSSA list, a revised audit tool was compiled, based on the FSDOH's provincial list (PPTC 2016) and the EMSSA's lists of medication and equipment (EMSSA 2008a; 2008b). Data from the pilot study were not included in the main study.

Data Analysis

Data were analysed by the Department of Biostatistics, Faculty of Health Sciences, of the University of the Free State (UFS). Results are summarised by means, medians and ranges (numerical variables) and frequencies and percentages (categorical variables). Spearman rank correlation coefficients were calculated between compliant percentage for consumables, equipment and medication.

Of the 148 items on the audit tool, the 128 items of the FSDOH provincial list (PPTC 2016) were used for analysis purposes and included: 66 items for consumables, 31 for equipment and 31 for medication.

The following coding system was used for analysis of the consumables and medication:

- 1 = fully compliant (correct number, all are usable, and none is expired)
- 2 = incomplete number, but some usable (too little present or some expired)
- 3 = only expired stock is present
- 4 = not present

An extra criterion was added for medication:

3.5 = medication expired for more than three months

This additional criterion was used since medication degrades over time, and the likelihood of insufficient drug content thus increases over time (De Winter et al. 2013; Parish et al. 2016). The three-month cut-off is arbitrary, as the rate of degradation differs between drugs, however, it helps to distinguish between a recent oversight of expiry and systemic factors of lack of regular review.

The following coding system was used for analysis of the equipment:

1 = fully compliant (functional for all applications as far as can be judged)

2 = present but not fully functional (e.g. only paediatric adjuncts but no adult ones)

4 = not present

Ethical Considerations

The study was approved by the Health Sciences Research Ethics Committee of the UFS (HSREC-S 43/2016) and permission to conduct the study was obtained from the FSDOH. Confidentiality was maintained in the audit tool coding and data analysis. Signed informed consent was obtained from the sisters in charge of each clinic.

Results

During the study period, all 16 clinics in the Bloemfontein sub-district of Mangaung were audited. Table 1 shows the mean, median, minimum and maximum values for the percentage of consumables, equipment and medication fully compliant, incomplete but usable, only expired stock, and not present. For consumables, the mean value for the percentage fully compliant was 45.2 per cent (range between worst and best performing clinic 31.8–66.7%) and for not present was 43.5 per cent (range 28.8–57.6%). Adding the mean of 6.9 per cent of items that were found to be usable but not present in the required amount would only marginally increase the total compliance rate to a mean of 52.1 per cent. Three of the 66 emergency consumables (4.5%) audited were noted as absent at all the clinics surveyed. These items were: cuffed endotracheal tubes size 6.5, uncuffed endotracheal tubes size 4.5, and 14 g infusion cannula.

For equipment, the mean value for the percentage fully compliant was 52.8 per cent (range 45.5–63.3%) and for not present was 44.0 per cent (range 26.7–61.3%). Two of the 31 items of equipment (6.5%) audited were noted as absent at all the clinics. These items were: intubation forceps Magill, neonatal, and intubation forceps Magill, paediatric. Only two (12.5%) of the 16 clinics had an automated external defibrillator (AED).

For medication, the mean value for the percentage fully compliant was 58.1 per cent (range 35.5–77.4%) and for not present was 23.6 per cent (9.7–54.8%). Adding the

12.7 per cent of items that were usable but too few in number would raise the mean percentage for compliance to 70.8 per cent. Only one of the 31 items of medication (3.2%) was noted as present at all the clinics, namely isosorbide dinitrate tablets 5 mg.

Table 1: Mean, median, minimum and maximum values of the percentage items present, fully compliant or not present for consumables, equipment and medication (n = 16)

	Mean	Median	Minimum	Maximum
Consumables				
Fully compliant	45.2	43.9	31.8	66.7
Incomplete number but usable	6.9	6.1	0	13.6
Only expired stock present	4.6	3.0	0	15.2
Not present	43.5	42.4	28.8	57.6
Equipment				
Fully compliant	52.8	54.1	45.5	63.3
Present but not fully functional	3.3	3.2	0	10.0
Not present	44.0	45.2	26.7	61.3
Medication				
Fully compliant	58.1	58.1	35.5	77.4
Incomplete number but usable	12.7	12.9	3.2	22.6
Only expired stock present	4.2	3.2	0	19.4
Not present	23.6	19.4	9.7	54.8
Medication has expired > 3 months	1.4	0	0	6.5

Figure 1 illustrates the percentage of compliance for each clinic according to consumables, equipment and medicine.

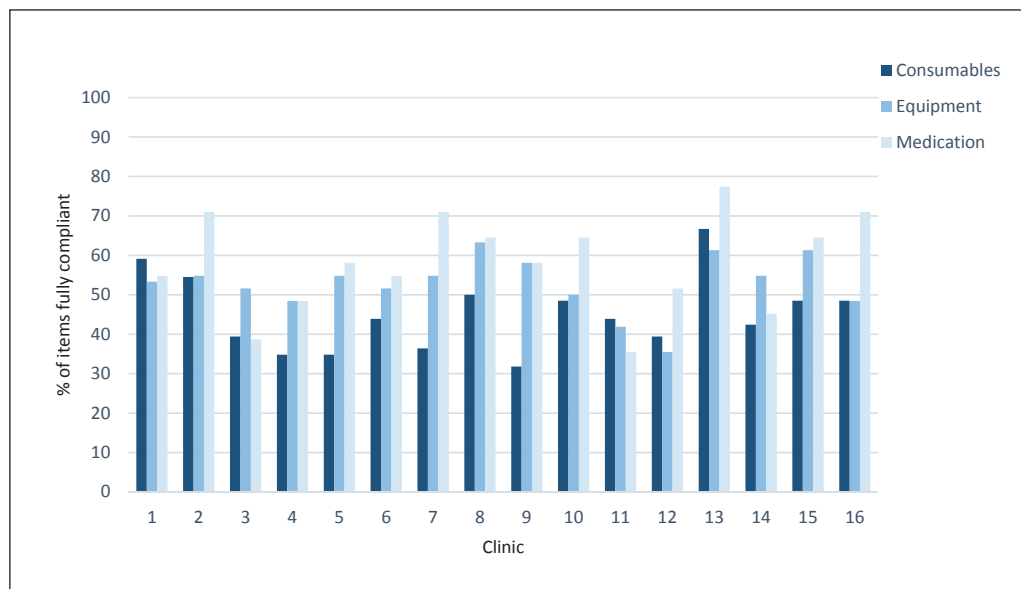


Figure 1: The percentage compliance of the individual clinics (n = 16) regarding consumables, equipment and medication

Figure 1 allows an overview of how well (or not) an individual clinic scored with regard to fully compliant items for each of the three sub-categories. There is a wide spread between the different clinics within each of the three sub-categories. And even though there are certain clinics that perform either consistently well (clinic no 13) or poorly (clinic nos 3, 11 and 12), for most of the clinics there is also considerable variation between their performances in each of the three sub-categories. Correlations regarding compliance were as follows: consumables with equipment 0.24 ($p = 0.37$), consumables with medicines 0.45 ($p = 0.08$) and equipment with medicines 0.51 ($p = 0.05$).

As shown in Figure 2, six of the clinics scored less than 40 per cent compliance for consumables, and seven scored between 41 per cent and 50 per cent, thus 81 per cent of the clinics did not have more than half of the consumables items available in usable condition and prescribed numbers. The values are not as poor for equipment and medication, with respectively one and two clinics scoring less than 40 per cent compliance. Only one quarter of the clinics had more than 70 per cent of the emergency medication items available as prescribed. No clinic was in the compliance range of above 70 per cent for consumables or equipment, and none of the clinics achieved a compliance rate of above 80 per cent in any of the sub-categories.

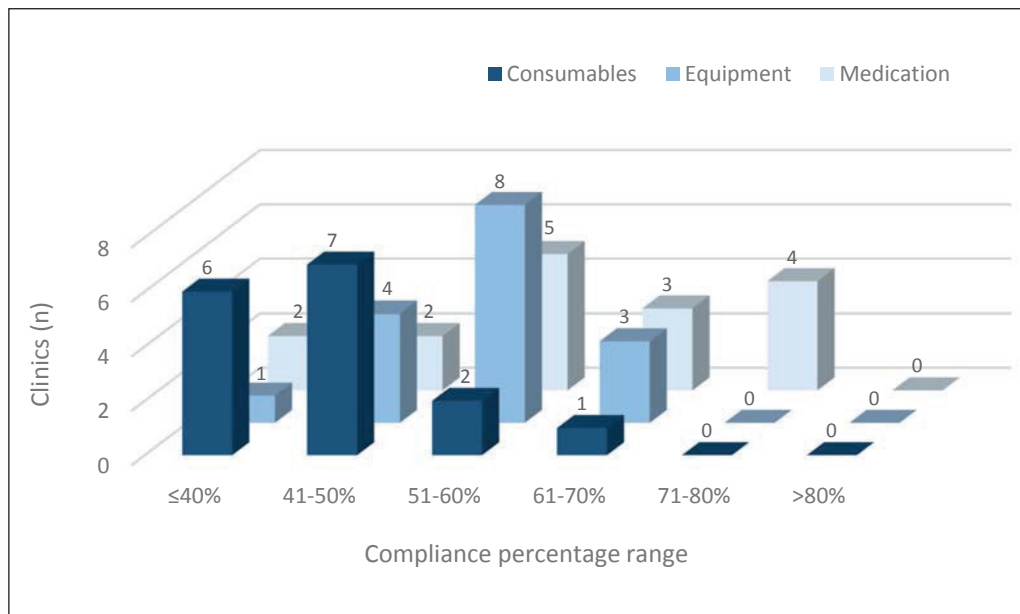


Figure 2: Number of clinics (n = 16) per compliance percentage range for the three sub-categories

Table 2 indicates the most common emergencies reported by the clinics as well as the compliance regarding main medication of these conditions.

Table 2: Most common emergencies seen at the 16 clinics

	Common emergencies	Medication available at clinic
	n (%)	%
Asthma	7 (43.8)	
Salbutamol 0.5% 20 ml nebuliser solution		87.5
Ipratropium bromide 0.25 mg/ml or 0.5 mg/ml nebuliser solution		68.8
Hydrocortisone 100 mg IV		87.5
Magnesium sulphate IV		75.0
Hyperglycaemia	7 (43.8)	
Ringers lactate 1 000 ml IV		62.5
Subcutaneous insulin		68.8
Hypoglycaemia	5 (31.3)	

Dextrose 50% 50 ml IV		87.5
Glucose 5% 200 ml or 1 000 ml IV		81.3
Hypertension	5 (31.3)	
Diazepam 10 mg (sublingual)		56.3
Amlodipine 10 mg orally		87.5
Nifedipine 10 mg orally		56.3
Respiratory distress	5 (31.3)	

Medication for the emergencies in accordance with Kloeck (2017).

For the management of respiratory distress, equipment and consumables necessary for an endotracheal intubation along with emergency needles are used. Apart from the items previously stated as being absent, most of the items necessary for management of respiratory conditions were noted as present.

During the data collection for the audit, a number of practical questions came up. These matters required consistent rules to ensure reliable audit results, and the amended rules as applied during the audit are included in Table 3.

Table 3: Practical questions to be answered in an audit guide

Question	Background	Rule/conclusion
Should the item be counted as compliant if it is to be found elsewhere in the clinic?	Some items require refrigeration, coded drugs such as narcotics need to be locked away; items might be in the store but not on the emergency trolley.	Items that require specific storage (refrigeration, locker) were to be counted if found there. Other items were only to be counted if on or near the emergency trolley.
Should the function of equipment be tested, and how?	Some items might be physically present but of no use, e.g. laryngoscope without batteries, suction without tubing.	Simple function tests for some of the items were applied. Clear "how to" instructions should be included in the audit manual.
Are there acceptable alternatives to substitute for an item?	The function of some items might be achieved by "substitutes", e.g. calcium chloride for calcium gluconate.	No substitutions were allowed.

Discussion

The Ideal Clinic Manual, version 16 from 2016 (NDOH 2016), as guidance for the “re-engineering” of South African primary healthcare clinics, contains a “Checklist for resuscitation room” (annexure 73) and a “Checklist for emergency trolley” (annexure 74). The Ideal Clinic programme uses colour-coding to indicate compliance: the “green” area for both checklists is given as 100 per cent, with scores of 40–99 per cent being “amber”, and less than 40 per cent coded as “red”. Although this audit did not use the same tools, if the same percentage ranges were applied to the findings, seven out of the 16 clinics would score in the “red” area as they achieved less than 40 per cent in at least one of the three sub-categories of the audit (Figure 1). The fact that in some clinics for up to 15 per cent of the consumable items and 19 per cent of the medication items only expired stock was present, and that in some clinics up to almost seven per cent of the medication items had expired more than three months, suggests a generally rather poor “culture of maintenance” of these emergency trolleys.

The three sub-categories we used did not show a high correlation between the way a particular clinic performs in one sub-category and its performance in the other sub-categories. This suggests that there might be different factors at play influencing the performance of the clinics in the different categories. In practical terms, this implies that the audit should not be reduced to one or two categories, as they might not be representative of the overall performance.

Unsettling as the findings are, the results are comparable to what has been found in other South African primary healthcare (Adamson 2012; Dlamini 2004; Thandrayen and Saloojee 2010) and hospital environments (Botha and Kotze 2014). There seems to be an urgent need to improve the management of emergency stock in the primary healthcare clinics. Potential obstacles to such an improvement might be the sometimes contradictory or inconsistent rules as given by the respective bodies. The EMSSA is an association of clinicians who work in the field of emergency care, and its guidelines therefore have the status of only recommendations. Documents authored by the National Department of Health such as the Standard Treatment Guidelines (NDOH 2014) and the Ideal Clinic checklists (NDOH 2016) need to be brought in line with the provincially issued documents, such as circulars, on required equipment and provincial code lists, as the latter would be regarded as the most “binding” by the provincially appointed clinic staff. Discrepancies in this field are, for example, that the Ideal Clinic checklists do not list the number of ampules required to be stored, as some emergency conditions might require significantly more than one ampule as in the case of adrenaline for cardiopulmonary resuscitation, atropine for certain poisonings or magnesium sulphate in pre-eclampsia, while the provincial circular lists an additional size of endotracheal tubes (5.5) that is not included in the Ideal Clinic checklists.

In defence of the clinics, it needs to be stated that certain items, albeit prescribed, might be hard to obtain. An AED is expensive and rarely used in a primary healthcare clinic,

and the acquisition of other more commonly used equipment might be prioritised. The way circulars (and the audit tool based on those) are composed could also be contributing to the difficulty to comply with it, as for example, the list of prescribed medications contains two different doses of “ipratropium bromide nebs” used for nebulisation in asthmatic patients (0.25 mg/2 ml and 0.5 mg/2 ml) (PPTC 2016). There is no clinical necessity to have these two dosages available, and the Ideal Clinic checklist lists them as alternatives under the same item. In addition, the reality is often that this medication is provided as a combination product with another drug (such as salbutamol) that is used concurrently for the same indication.

In the latest update of the Ideal Clinic checklists, a larger degree of flexibility with regard to sizes has been included. When in the previous version the sizes of uncuffed endotracheal tubes required were “2.5, 3.5 and 4.5 mm” and for sterile gloves “6.5, 7, 7.5 and 8” (NDOH 2016), the sizes required are now listed as “2 or 2.5, 3 or 3.5 and 4 or 4.5 mm” and “6 or 6.5 and 7 or 7.5 and 8”, respectively (NDOH 2017b). This change resolves a practical challenge often encountered during the audit (Table 3), when the clinic would have a size 4 mm tube or size 6 pair of gloves, but by strict application of the audit tool, the respective item would have to be marked as “absent”.

Lastly, it needs to be acknowledged that this audit did not deal with any aspects of clinical skills or scope of practice. One might argue that the lack of availability of AEDs might in part be caused by a lack of proficiency in using the device – a skill that is being taught in basic resuscitation courses, but if the staff have not been trained, a “lack of demand” might result from insecurity. Similarly, some of the equipment listed are required only for procedures that are not part of a registered nurse’s scope of practice – endotracheal tubes and the laryngoscope to insert them would thus be only made available for when an intubation is necessary and a clinician trained to use the equipment is present.

Reassuringly and in line with this thought, most of the medication for the emergencies commonly reported in the clinics had a high level of availability.

Study Limitations

Only a small number of clinics, namely the ones in the Bloemfontein sub-district of the Mangaung district, were surveyed, and only the material preparedness, but not the available skills, was assessed. The audit tool was largely numeric, without much consideration of the actual clinical relevance of the individual items prescribed by the provincial circular, which could result in similar scores for a clinic that “only has what one really needs” and another clinic that “only has what one never uses”.

The Hawthorne effect might have come into play in this study, which is described as the tendency of people to alter their behaviour due to their awareness of being part of research (Mehay 2012). The clinic staff may thus have ensured that equipment was functional and medication in the emergency trolley was available after being informed

about the study, which could have introduced bias. The study did also not look at the reasons why some of the stock were not there and/or expired, for example, whether there were difficulties with the supply.

Conclusion

Almost half of the clinics audited scored very low in at least one of the sub-categories, indicating an urgent need for improved management of the emergency preparedness of the primary healthcare clinics in Bloemfontein. A number of practical challenges originating from the audit tool and from the official documents used to compile it have been identified. In these times of “re-engineering of primary healthcare”, the regulatory environment (for example, prescribed equipment) is being updated frequently, requiring the audit tools to be updated similarly. Clear audit rules are necessary to guide the data collection with such an audit tool and to ensure reliable measurements.

Recommendations

In future, more regular audits using standardised tools should be implemented. Data obtained through such audits should be collected and used for the monitoring of “process quality” and “structural quality”. Using such data as part of the performance assessment of responsible managers would increase the accountability of personnel, based on objective data. Additional items such as basic CPR training to monitor available skills should be included in the audits, and such training together with regular fire drills might improve the provision of emergency stock through increased awareness of its importance.

Acknowledgements

The authors thank Dr P. A. Hagemeister, Clinical Manager, Mangaung Health District, for facilitating the data collection at the clinics, the relevant staff at the 16 clinics for their assistance and cooperation, and Ms T. Mulder, medical editor, School of Medicine, UFS, for the technical and editorial preparation of the manuscript.

References

- Adamson, K. 2012. “Are We Ready for an Emergency?” Master of Medicine dissertation, Stellenbosch University. <http://scholar.sun.ac.za/handle/10019.1/97212>.
- Botha, R. W., and B. Kotze. 2014. “The Preparedness of Bloemfontein Radiographers for Common Medical Emergencies.” *Journal for New Generation Sciences* 12 (2): 18–28.

- Daviaud, E., and H. Subedar. 2012. "Staffing Norms for Primary Health Care in the Context of PHC Re-Engineering. Report to the National Department of Health." Cape Town: Medical Research Council. Accessed 12 July 2017. <http://www.mrc.ac.za/sites/default/files/files/2016-07-14/StaffingNorms.pdf>.
- De Winter, S., P. Vanbrabant, N. T. Vi, X. Deng, I. Spriet, A. van Schepdael, and J. B. Gillet. 2013. "Impact of Temperature Exposure on Stability of Drugs in a Real-World Out-of-Hospital Setting." *Annals of Emergency Medicine* 62 (4): 380–387.e1. <https://doi.org/10.1016/j.annemergmed.2013.04.018>.
- Dlamini, N. J. 2004. "Views of Health Care Services Consumers in Rural Communities on Provision of Health Care in KwaZulu-Natal Province." PhD dissertation, University of KwaZulu-Natal. <http://196.21.83.35/handle/10530/849>.
- EMSSA (Emergency Medicine Society of South Africa). 2008a. *Practice Guideline EM004. Emergency Centre Equipment*. Accessed 12 July 2017. <http://emssa.org.za/documents/em004.pdf>.
- EMSSA (Emergency Medicine Society of South Africa). 2008b. *Practice Guideline EM005. Recommended Drugs for Emergency Centres*. Accessed 12 July 2017. <http://emssa.org.za/documents/em005.pdf>.
- EMSSA (Emergency Medicine Society of South Africa). 2008c. *Practice Guideline EM006. Resuscitation Trolley Equipment*. Accessed 12 July 2017. <http://emssa.org.za/documents/em006.pdf>.
- Kloeck, W. G., ed. 2017. *A Guide to the Management of Common Medical Emergencies in Adults*. 11th ed. Johannesburg: Academy Advanced Life Support.
- Mangaung Metropolitan Health District. 2017. *District Health Plan 2017–2018*. Bloemfontein: Free State Department of Health.
- Mehay, R., ed. 2012. *The Essential Handbook for GP Training and Education*. London: Radcliffe Publishing.
- NDOH (National Department of Health South Africa). 2014. *Standard Treatment Guidelines and Essential Medicines List for South Africa*. Primary Health Care Level. 5th ed. Pretoria: National Department of Health. Accessed 12 July 2017. https://www.idealclinic.org.za/docs/guidelines/STG%20and%20EML_PHC_2014.pdf.
- NDOH (National Department of Health South Africa). 2016. *Ideal Clinic Manual v16*. Pretoria: National Department of Health. Accessed 12 July 2017. <https://www.idealclinic.org.za/docs/2016/Ideal%20Clinic%20Manual%20v16%20-%202023Jun16.pdf>.
- NDOH (National Department of Health South Africa). 2017a. *National Health Act, 2003. National Health Insurance Policy. Towards Universal Health Coverage*. (White Paper). Government Gazette No. 40955. Pretoria: Government Printers.
- NDOH (National Department of Health South Africa). 2017b. *Ideal Clinic Definitions, Components and Checklists. Revised February 2017*. Pretoria: National Department of Health. Accessed 14 July 2017. <https://www.idealclinic.org.za/docs/guidelines/Booklet%20-%20Ideal%20Clinic%20Dashboard%20-%20revision%2016%20published%20Feb%202017.pdf>
- Office of Health Standards Compliance. n.d. South Africa (website). Accessed 12 July 2017. www.ohsc.org.za.

- Parish, H. G., C. S. Bowser, J. R. Morton, and J. C. Brown. 2016. "A Systematic Review of Epinephrine Degradation with Exposure to Excessive Heat or Cold." *Annals of Allergy, Asthma and Immunology* 117 (1): 79–87. <https://doi.org/10.1016/j.anai.2016.04.006>.
- PPTC (Provincial Pharmaceutical Therapeutics Committee). 2016. *Circular INT03/16 Emergency Trolleys*. Bloemfontein: Free State Department of Health.
- South Africa. 1996. *Constitution of the Republic of South Africa, 1996 (Act No. 108 of 1996)*. Pretoria: Government Printers.
- Thandrayen, K., and H. Saloojee. 2010. "Quality of Care Offered to Children Attending Primary Health Care Clinics in Johannesburg." *South African Journal of Child Health* 4 (3): 73–77.