

# Innovations in the clinical care of mothers and children in South Africa: The contribution of district clinical specialist teams

U Feucht,<sup>1,2,3</sup> PhD; C Marshall,<sup>3,4</sup> MMed (Community Medicine); S Kauchali,<sup>4,5</sup> MPhil; P Barron,<sup>6</sup> FFCH (SA); L Slavin,<sup>7</sup> FCPaed (SA); S Bhardwaj,<sup>7</sup> MD; Y Pillay,<sup>4</sup> PhD

<sup>1</sup> Department of Paediatrics, School of Medicine, Faculty of Health Sciences, University of Pretoria, South Africa

<sup>2</sup> Tshwane District Health Services, Gauteng Department of Health, South Africa

<sup>3</sup> Research Centre for Maternal, Fetal, Newborn and Child Health Care Strategies, Faculty of Health Sciences, University of Pretoria, South Africa

<sup>4</sup> National Department of Health, Pretoria, South Africa

<sup>5</sup> Department of Paediatrics and Child Health, Nelson Mandela School of Medicine, College of Health Sciences, University of KwaZulu-Natal, Durban, South Africa

<sup>6</sup> School of Public Health, Faculty of Health Sciences, University of the Witwatersrand, Johannesburg, South Africa

<sup>7</sup> United Nations Children's Fund (UNICEF), Pretoria, South Africa

**Corresponding author:** U Feucht (ute.feucht@up.ac.za)

The contribution of the District Clinical Specialist Teams (DCSTs) to improving maternal and child health outcomes in South Africa, through strengthening the four pillars of clinical governance, is reflected in innovative work presented at a 'Promising Practices' symposium and at various conferences. Of the 24 identified DCST innovations, 21% reflected the clinical effectiveness pillar, 17% clinical risk management, 41% staff development, and 21% user-related considerations. In order to ensure scale-up, the submitted best practices/innovations were reviewed using the World Health Organization quality standards and ExpandNet parameters for likely scalability. Here we describe one case study from each pillar, illustrating the contribution of the innovations to improved patient outcomes. The development and scale-up of innovations needs to be institutionalised and must include effective support and action from the relevant health managers.

*S Afr Med J* 2018;108(3 Suppl 1):S38-S43. DOI:10.7196/SAMJ.2018.v108i3.12808

In 2010 concern was raised that South Africa (SA) was falling short in achieving the Millennium Development Goals. Despite being a middle-income country, high levels of maternal and child mortality persisted, notwithstanding progressive improvements in the inherited inequitable health system.<sup>[1]</sup> As a major contributor to the high mortality rates, HIV was now being addressed in line with international best practice. However, poor quality of clinical care remained a significant challenge towards achieving improved outcomes, despite relatively high government expenditure.<sup>[2]</sup>

The District Clinical Specialist Team (DCST) is an initiative established in SA in 2011 to improve the maternal, neonatal, child and women's health (MNCWH) outcomes through enhanced clinical governance.<sup>[3]</sup> This is defined as a 'framework through which ... organisations are accountable for continually improving the quality of their services, and safeguarding high standards of care by creating an environment in which excellence in clinical care will flourish.'<sup>[4]</sup>

Four pillars form the basic framework for the work of the DCSTs in the SA clinical

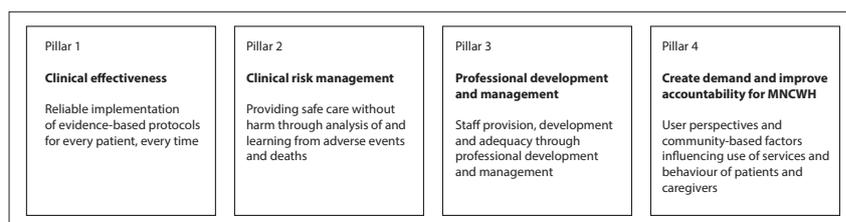


Fig. 1. Pillars of clinical governance for the District Clinical Specialist Teams.<sup>[5]</sup> (MNCWH = maternal, neonatal, child and women's health.)

governance model (Fig. 1). DCSTs were recruited at the primary care level in all districts. Teams consist of three doctor-nurse pairs (obstetrician and advanced midwife, paediatrician and paediatric nurse, family physician and primary healthcare nurse) together with an anaesthetist. DCSTs are in a unique position to develop best practices or innovations.<sup>[6]</sup> The main aim of this paper is to highlight the contribution of the DCSTs to improving maternal and child health outcomes in SA through strengthening the four pillars of clinical governance, as illustrated by four case studies selected from among 24 best practices/innovations submitted by DCST members. These are

reviewed against standards of quality and predictors of successful scale-up, in addition to outlining likely paths to successful implementation. The paper concludes with recommendations on the processes that are essential to the implementation and scale-up of the innovations.

## Methods

### Identification and categorisation of innovation

To encourage the sharing of innovations, the National Department of Health (NDoH) sent a request for concepts to all DCST members. Twenty of the 42 responses received were selected by a panel and

subsequently presented at a Promising Practices symposium in 2016. Four additional practices were later identified through conference presentations. Innovations were then categorised into the four pillars of clinical governance, based on their primary purpose (Table 1).

### Criteria for review

Innovations were then reviewed against the World Health Organization (WHO) quality standards and WHO attributes for potentially scalable innovations. These are shown in Table 2.<sup>[7,8]</sup>

## Results

### Quality standards

All innovations directly or indirectly supported the delivery of evidence-based care (Standard 1), reflecting the initial selection process. They were a response to a problem, based on actionable information (Standard 2), from the routine information system and from more granular data obtained from clinical audits. Referrals and continuity of care were mentioned in 11 out of 24 submissions (Standard 3), while communication with patients ( $n=9$ ), respectful care ( $n=3$ ) and provision of emotional support ( $n=3$ ) were mentioned less frequently (Standards 4 - 6). Staff competence and organisation (Standard 7) was a component of all practices, while essential health facility infrastructure (Standard 8) was mentioned in 11 cases. Most innovations also highlighted the importance of a referral chain and of sector co-ordination.

### Scale-up potential

The innovations reflected credible and feasible approaches to important problems, therefore demonstrating positive predictors of scalability. Documentation of impact, however, was variable at the time of presentation. Identification of the primary user was of importance, as the authors considered those innovations with clear benefit for clinicians (the primary focus group of the DCSTs) to be more scalable than those necessitating management buy-in and action, given the variability in management authority and accountability in different settings. In about a third of cases, the innovation was fairly complex, requiring expert support, while a few needed actual policy changes.

## Case studies illustrating the four pillars of clinical governance

Four case studies were chosen to be presented in this article as examples of the innovations reviewed, as they illustrate the four pillars and meet most of the relevant quality standards and predictors for scalability.

### Pillar 1: Reliable implementation of protocols for gestational hypertension

#### Problem statement and response

High numbers of maternal deaths due to hypertension were recorded in the Amathole District in 2013. At 58% of deaths ( $n=7/12$  deaths), this was three times the national average of 15%.<sup>[9]</sup> Contributory factors, as identified by the local DCST, included:

- High risk antenatal care (ANC) for gestational hypertension was available at district hospitals, but lack of early recognition, inappropriate classification, non-adherence to protocols, infrequent patient follow-ups and high defaulter rates occurred.
- Eclampsia and severe pre-eclampsia cases were inappropriately transferred from clinics to district hospitals, instead of directly to tertiary hospitals, by ambulance crews who also lacked the necessary skills to ensure safe transport.
- Challenges were experienced in the mentoring of clinicians, as the patient-held maternity case records were not available and problems were only identified at post-natal audits.

The DCST conducted workshops to train clinic nurses and hospital maternity staff on the clinical management of hypertension in pregnancy. Doctor-nurse teams were identified as champions at high-risk ANC clinics to audit hypertension management and inform the DCST of mentoring and support needs. Quality assurance managers conducted monthly scoring of antenatal records at delivery sites based on DCST guidance, with feedback given to clinics at review meetings. The referral system for patients with severe gestational hypertension was revised to fast-track access to level 3 hospital care for seriously ill patients, bypassing district hospitals.

The central innovation was a facility-held tracer card developed to follow up and monitor fidelity to clinical guidelines on gestational

**Table 1. Number and percentages of innovations per clinical governance pillar**

Clinical governance pillar	From DCST symposium	Other source	Number of innovations, <i>n</i> (%)
Clinical effectiveness: Use of evidence-based protocols	4	1	5 (21)
Clinical risk management: Safe care without harm	4	0	4 (17)
Professional development and management	9	1	10 (41)
Create demand and improve accountability for MNCWH	3	2	5 (21)

DCST = District Clinical Specialist Teams; MNCWH = maternal, neonatal, child and women's health.

**Table 2. Criteria used to review innovations<sup>[7,8]</sup>**

Quality standards	Predictors of scalability
1. Evidence-based care and management of complications	1. Credible/based on sound research
2. Health information systems enabling the use of data for action	2. Observable/potential users can see results
3. Application of referral systems	3. Relevant to addressing persistent or pertinent problems
4. Effective communication responding to needs	4. Advantage over existing practices (potential users perceive benefits as higher than costs of implementation)
5. Respectful clinical care	5. Easy to understand and implement
6. Provision of emotional support sensitive to needs	6. Compatible with user values, norms and practices and aligned with national programmes
7. Competent staff	7. Testable
8. Health facility with optimal physical environment	

hypertension. Concomitant training of clinic supervisors, MNCWH programme managers and maternity operational managers was done. Scale-up of the checklist was done with a focus on healthcare facilities where deliveries took place. Scores obtained during audits were then used to build dashboards, resulting in structured feedback to clinicians and managers.

#### Outcomes

As part of the intervention, local audits were conducted to gain an in-depth understanding of the clinical problems and to measure the impact of the intervention. The institutional Maternal Mortality Rate (iMMR) dropped from 83/100 000 (2013) to 44/100 000 (2015) after the intervention, with maternal deaths due to hypertension reducing from 58% (7/12 deaths; 2013) to 33% (2/6 deaths; 2014) to 20% (1/5 deaths; 2015). Maternal deaths at the level of the tertiary hospital reduced from 18 deaths (2014) to 10 deaths (2015) to 9 deaths (2016), indicating that the rerouting of ambulances transporting seriously ill patients did not lead to an increased mortality at tertiary level.

Review findings from the Perinatal Problem Identification Program (PPIP) indicate that perinatal deaths due to hypertension reduced from 16.4% (2013) to 6.9 % (2014), with stillbirth rates improving from 17/1 000 (2013) to 13.3/1 000 (2014). The improvements were sustained during 2015 (14.1/1 000); however, a slight increase in stillbirths in one of the district hospitals was noted, triggering more intensified clinical oversight and training.<sup>[10]</sup>

#### Implications and scalability

Improving clinical care and systems for the management of gestational hypertension has great potential impact if implemented at scale. These innovations meet the quality standards relating to the implementation of evidence-based protocols, referral systems and the use of actionable information, as well as the human resources standard.

This initiative is a good candidate for future scale-up. Clinical audit and health system strengthening are part of DCSTs' scope and capacity. Action by managers is, however, critical for effective implementation. Universal introduction of the checklist would require further refining and testing to determine benefits and processes in different settings before a policy decision is made.

### Pillar 2: Managing clinical risk across a catchment area to reduce maternal deaths

#### Problem statement and response

The Saving Mothers Report (2011 - 2013)<sup>[11]</sup> noted high maternal mortality ratios (MMRs) in the eThekweni Metro: 197.6/100 000 live births, compared with 171.1/100 000 for KwaZulu-Natal Province and 158.3/100 000 for SA as a whole. Approximately 5 000 deliveries per month occurred across the Metro, with 101 deaths in 2014. However, the DCST found that staff in the district had no consolidated understanding of the reasons for the maternal deaths, including main causes and avoidable factors identified during mortality review meetings. Importantly, regional and tertiary hospitals did not report their deaths to district management or the DCST. Of relevance is the fact that there are two tertiary, four regional and four district-level hospitals in the district, as well as over 100 primary healthcare clinics and 16 midwife obstetric units, emphasising the need for a coordinated approach to maternity care.

The district manager, assisted by the DCST, convened a meeting attended by all hospital and nurse managers and heads of obstetric departments. The need to conduct maternal mortality meetings within 72 hours of each death was emphasised. Since April 2015, the DCST produces a quarterly metro-wide report covering all levels of

care, including regional and tertiary hospitals, across the catchment area. It includes the number of deaths and relevant mortality rates, referrals between facilities and from other districts, and information on causes of death and avoidable factors. The report is presented at the district quarterly Perinatal Mortality and Morbidity Meeting and guides the quality improvement plans which address the main avoidable factors and other associated problems. Examples include improvement of clinical care at primary healthcare level, implementing a dedicated form to capture relevant HIV information in maternity charts, and auditing of all cases of ruptured uteri.

#### Outcomes

As part of the intervention, the DCST scrutinised local audit data to identify challenges and measure the impact of quality improvement interventions. Major discrepancies between the audit data and data from the District Health Information System (DHIS) were noted, which were likely linked to underreporting on the DHIS. During 2014 there were 101 recorded institutional maternal deaths (iMMR of 173.8/100 000 live births), with scanty details available on causes of deaths and avoidable factors. By 2016, maternal mortality reporting had greatly improved, with 71 deaths counted and an iMMR of 120/100 000. The level of healthcare at which the deaths were occurring was now well mapped: 29% at tertiary hospitals, 51% at regional hospitals, 14% at district hospitals and 6% at clinics. There were fewer unknown causes of death, and medical and surgical disorders were now the most common cause of death (24%), rather than primary obstetric causes, with non-pregnancy related infections and hypertension contributing 18.3% each to the mortalities. (Audit data supplied by T Ibrahim, eThekweni DCST Obstetrician).<sup>[10]</sup>

Since 2015, seven maternal mortality reports have been generated, and death reporting systems have been streamlined and improved to reduce under-reporting. Facilities have a more than 90% fidelity with maternal mortality reporting within 72 hours, with top management and DCST present at reviews. Action plans are then drawn up, and feedback to level 1 facilities is done by the DCST, if necessary. Responsibility and accountability for the implementation of action plans, however, remains a constant challenge.

#### Implications and scalability

Learning from every maternal death to improve the management of clinical risk through specific and local problem identification across a catchment area has the potential to rapidly reduce maternal mortality. This innovation is focused on strengthening the health system across an entire catchment or referral area to enable implementation of protocols. This addresses the first three quality standards as well as those related to staff practice and essential resources. Dissemination of this process through other DCSTs could easily be achieved. No additional resources are needed. However, the key requirement of management accountability for each death, in order to ensure effective action, is the critical success factor.

### Pillar 3: Staff development through effective paediatric clinical skills training

#### Problem statement and response

Review of child deaths using the Child Problem Identification Programme (CHIP) in the Ugu District revealed local gaps and weaknesses in paediatric district hospital care. After further investigations, the DCST concluded that the knowledge base was lacking, as the same modifiable factors came up repeatedly. Staffing constraints were impacting on monthly outreach visits by the regional hospital paediatricians and on training opportunities for district hospital doctors at the regional hospital. Staff training courses

on all relevant child health programmes were being conducted, often requiring extended (3 - 11 days) attendance. However, the DCST assessed these to have limited impact, with suboptimal practices persisting and limited cascading of knowledge to colleagues who did not have the opportunity to attend the trainings.

In response to the identified gaps, the DCST paediatrician developed an on-site customised modular training programme. Training modules were delivered to clinical staff and hospital management through short, 2-hour training sessions run four times during a day-long visit, permitting all staff (including night shift and after-hours non-paediatric doctors) to attend without significantly compromising patient care. Sessions included a theoretical component and a focus on practical skills and procedures, for example intubation. The setting was small group teaching, with repetition and assessment in an interactive environment, where questions were asked and weaknesses identified.

Future suggestions were to include local nurses and doctors in the process of tailoring the training content, to email theory prior to sessions, to use e-learning platforms, and to conduct baseline knowledge tests. Within the district health services, the DCST's role needs to include such training as a core business. Major challenges remain with non-permanent staff such as sessional doctors, knowledge gaps in foreign-trained doctors, as well as the continued high turnover of staff, and structured follow-up of clinical practice after completion of training modules is needed.

#### Outcomes

Staff members embraced the training approach and contributed to the topics for the training agenda. Clinical patient management improved, as observed during discussions at local CHIP meetings. Onsite DCST support ward round visits showed entrenchment of evidence-based paediatric practice, with improved understanding of the essentials of paediatric care by the entire medical team at the hospital, with improved oversight by the DCST and teamwork within the district.

As illustrated, improved outcomes in terms of childhood mortality were achieved in one of the district hospitals after intensive modular training was conducted. CHIP data show that the hospital had 12 childhood deaths during the first 6 months of 2016, which was reduced to 7 childhood deaths during the same period in 2017. The in-hospital modifiable factors identified on audit also decreased from 10 to 1 during the corresponding periods. A decrease in number and better quality of intensive care referrals was also noted. (Audit data supplied by R Naidoo, Ugu DCST Paediatrician; Ugu District CHIP, personal communication.)

#### Implications and scalability

Effectively targeted innovations to improve clinical skills of staff at facility level are critical, with the local implementers noting that change was affected by focussing on specific problems and not just common clinical conditions. Most of the quality standards are met.

This innovation falls within the DCSTs' scope and could easily be replicated, given the local availability of a DCST paediatrician. Required changes include the review of a narrow interpretation of the DCST job description, restricting time spent on teaching. Additionally, DCSTs need updates on best clinical practice as well as teaching skills, with assistance given in terms of modern teaching methods, and relevant equipment and internet connectivity being of importance. The use of e-learning platforms is a potential success factor, although the importance of face-to-face contact remains in order to ensure effective motivation and support of local staff members.

At a health system level, deficits in clinical skills of doctors and nurses point towards a serious problem in the level of basic training which

requires interventions. There are also issues in the prerequisites for contracting of sessional and foreign-trained doctors, which require involvement of health professional bodies.

#### Pillar 4: Addressing the determinants of severe acute malnutrition (SAM)

##### Problem statement and response

An increase in SAM cases in the Tshwane Metro was noted in 2015, where the staff in one sub-district were particularly concerned about the number of admissions and deaths in SAM children, as well as SAM readmissions after discharge. The need for a multi-disciplinary targeted intervention to improve outcomes resulted in the formation of a sub-district Malnutrition Working Group, established in April 2016 under the leadership of the DCST and the sub-district dietician, using the local district hospital as the focal point.

Team members included staff from the district hospital (paediatric services, emergency department, nutrition, social worker, HIV and tuberculosis services), district health services (nutrition, DCST, primary healthcare facilities, ward-based outreach teams, health promotion services, HIV and MCWNH programmes), social services as well as colleagues from the neighbouring province. Geospatial mapping of SAM admissions was done to pinpoint community hotspots for interventions, and contributory factors were identified using household questionnaires. Additionally, the team considered case studies and participated in morbidity and mortality meetings, with discussions on avoidable factors contributing to SAM deaths. This led to the development of locally adapted guidelines and protocols to address specific problems. In addition to meetings, the team used now widely available technology (email and WhatsApp groups) to facilitate patient referrals and sharing of information.

Challenges identified included inadequate referral systems and acute care in the hospital emergency department, in-hospital constraints to care (overcrowding) and nutritional supplementation stock-outs, especially for cross-boundary patients. Untreated HIV infection and HIV exposure were identified as contributors to malnutrition. The working group's leaders ensured the coordination of the diverse group to maintain momentum in implementing improvements. The involvement of the district management team was also important, especially in engaging on cross-boundary issues and with other relevant government departments.

##### Outcomes

Achievements hinge around the establishment of a communication network of relevant staff members in the sub-district, as well as the neighbouring province. Emergency clinical care of SAM children improved, with better triaging and initial patient management in the emergency department. Sub-district malnutrition guidelines were developed, printed and distributed, and relevant on-site training done, including training of the ward-based outreach teams. Lost-to-follow-up SAM children remained challenging, therefore emphasis was placed on building linkages between hospital staff, primary healthcare clinics, community care workers and social services.

Monitoring and evaluation included collecting local granular data on SAM admissions and case fatality rates, and also strengthening of the DHIS processes. The nutrition coordinator now attends monthly sub-district data verification meetings to ensure submission of clinically verified data. The impact of the clinical intervention, which started at sub-district level and expanded to improvement of SAM care in the entire district, on improvement of data quality is shown in Table 3. In 2014/15, only five hospitals submitted SAM data to the DHIS. This expanded to all nine hospitals in 2016/17. As a result of improved data quality, there was a paradoxical increase in

**Table 3. Inpatient SAM admissions and case fatality rates within healthcare facilities in the Tshwane District\***

Facility name	Level of care	2014/5			2015/6			2016/7		
		Inpatient SAM admissions, <i>n</i>	Inpatient SAM deaths, <i>n</i>	iCFR (%)	Inpatient SAM admissions, <i>n</i>	Inpatient SAM deaths, <i>n</i>	iCFR (%)	Inpatient SAM admissions, <i>n</i>	Inpatient SAM deaths, <i>n</i>	iCFR (%)
Jubilee Hospital	District	No data			60	3	5.0	113	19	16.8
Odi Hospital		90	4	4.4	63	5	7.9	64	2	3.1
Pretoria West Hospital		7	0	0	10	1	10.0	5	0	0
Tshwane District Hospital		25	3	12.0	25	0	0	20	0	0
Bronkhorstspuit Hospital		No data			No data			12	0	0
Mamelodi Hospital	Regional	55	9	16.6	37	6	16.2	47	8	17.0
Kalafong Hospital	Tertiary/central	No data			No data			82	1	1.2
Dr George Mukhari Hospital		224	17	7.6	192	12	6.3	150	7	4.7
Steve Biko Academic Hospital		No data			6	2	33.0	41	4	9.8
<b>Total</b>		<b>401</b>	<b>33</b>	<b>8.2</b>	<b>393</b>	<b>29</b>	<b>7.4</b>	<b>534</b>	<b>41</b>	<b>7.7</b>

DHIS= district health information system; SAM= severe acute malnutrition; iCFR= institutional case fatality rate.  
\*Data obtained from the District Health Information System.

the number of SAM admissions. Jubilee Hospital, the district hospital used as the node for the sub-district malnutrition group, progressed from having no SAM admissions recorded on DHIS to being the district hospital with the highest numbers in terms of SAM admissions and deaths. This highlights the critical role of DCST onsite support visits to identify clinical problems, without solely relying on DHIS data for decision making and planning of interventions.

**Implications and scalability**

Fragmentation of health services was noted as a big risk to holistic patient care. This innovation met most of the quality standards mentioned above. It did not require anything outside of routine clinical care. The improvement in quality was achieved through greatly enhanced multi-disciplinary team work using a subdistrict approach. Local replication of the model has already started in two additional sub-districts in the Tshwane District, with more to follow. However, wider scale-up would require a specific effort to entrench a collaborative work ethic, with clear communication and buy-in from stakeholders in different settings.

**Conclusion and recommendations**

DCSTs are generating innovations focused on key service delivery improvements, with notable outputs, and with documented reductions in institutional deaths and fatality rates over time, although in confined areas. Although clearly multi-factorial, with concurrent implementation of a range of evidence-based interventions to achieve these reductions, the improved processes and skills that these DCST innovations introduced are obvious enabling success factors.<sup>[12]</sup> The impact of the clinical interventions on the DHIS data quality is also evident, and highly beneficial, as this has the potential to lead to better decision making within the health system based on accurate data.

Encouraging more innovation and problem-solving skills is critical for DCSTs and for health professionals in general. Some

identified weaknesses in the currently reviewed initiatives include inadequate problem formulation and measurement of outputs and outcomes. Quality standards that were not addressed, including respect and dignity, communication and emotional support and, to a certain extent, in the management of essential physical resources, could be specifically targeted.

Adoption and implementation of innovations at scale cannot be assumed, and without a pathway to testing and scale-up, the impact will remain localised, even though the potential is clearly evident. To take advantage of innovations developed by the DCSTs, an agile and effective scale-up and dissemination approach is needed, based on the attributes of scalability and the characteristics of the SA health service itself. The team leads of the featured innovations, described the critical importance of ensuring managerial approval and support as a prerequisite for implementation, even at small scale.

Moving forward, the most promising innovations, with clear and encouraging results at local level, need to be supported towards scale-up. This scale-up strategy must include reflection on the barriers and drivers of actual implementation, and draw on the insights from the field of implementation science, which has identified competency/ability, organisation/systems and leadership as drivers of effective implementation.<sup>[13]</sup>

Encouraging the development and identification of innovations to successfully address the challenges facing the SA health system, and ensuring their scale-up, should become an accepted norm. Experienced and well-trained health workers, like the DCSTs, are in an ideal situation to contribute towards this process.

**Acknowledgements.** The authors thank all DCST staff members who contributed by supplying case studies and innovations. For the featured case studies, the following persons and districts are acknowledged: Dr Sibongile Mandondo, DCST Obstetrician, Amathole District; Dr Tasnim Ibrahim, DCST Obstetrician, Ethekewini District; Dr Romola

Naidoo, DCST Paediatrician, Ugu District; Ms Danielle Reyneke, subdistrict dietician; and Prof Ute Feucht, DCST Paediatrician, Tshwane District.

**Author contributions.** Conceptualisation: all authors; data review and analysis: CM, UF, SK, PB; writing: UF, CM, SK, PB.

**Funding.** None.

**Conflicts of interest.** None.

1. United Nations (UN). The Millennium Development Goals Report 2010. New York: UN, 2010. <http://www.un.org/millenniumgoals/pdf/MDG%20Report%202010%20En%20r15%20-low%20res%20100615%20-.pdf> (accessed 16 August 2017).
2. Naledi T, Barron P, Schneider H. Primary healthcare in SA since 1994 and implications of the new vision for PHC re-engineering. *S Afr Health Rev* 2011;17-28.
3. National Department of Health (NDoH). District Clinical Specialist Teams in South Africa. Ministerial Task Team Report, Pretoria: NDoH, 2011. <http://www.health.gov.za/index.php/2014-08-15-12-55-04/category/100-2012rpf?download=186:district-clinical-specialist-teams-in-south-africa-ministerial-task-team-report> (accessed 16 August 2017).
4. Scally G, Donaldson LJ. Clinical governance and the drive for quality improvement in the new NHS in England. *BMJ* 1998;317:61-65. <https://doi.org/10.1136/bmj.317.7150.61>
5. NDoH. Handbook for District Clinical Specialist Teams. Pretoria: NDoH, 2014. <https://www.health-e.org.za/wp-content/uploads/2015/06/Handbook-for-DCSTs.pdf> (accessed 16 August 2017).
6. Voce A, Bhana R, Monticelli F, et al. District Clinical Specialist Teams. *S Afr Health Rev* 2014;45-58.
7. World Health Organization (WHO). Standards for Improving Quality of Maternal and Newborn Care in Health Facilities. Geneva: WHO, 2016. [http://www.who.int/maternal\\_child\\_adolescent/documents/improving-maternal-newborn-care-quality/en/](http://www.who.int/maternal_child_adolescent/documents/improving-maternal-newborn-care-quality/en/) (accessed 16 August 2017).
8. World Health Organization (WHO). ExpandNet. Nine Steps for Developing a Scaling-up Strategy. Geneva: WHO, 2010. <http://expandnet.net/PDFs/ExpandNet-WHO%20Nine%20Step%20Guide%20published.pdf> (accessed 16 August 2017).
9. National Committee for Confidential Enquiry into Maternal Deaths. Saving Mothers 2011 - 2013: Sixth report on the Confidential Enquiries into Maternal Deaths in South Africa: Executive Summary. <http://www.kznhealth.gov.za/mcwh/Maternal/Saving-Mothers-2011-2013-Executive-Summary.pdf> (accessed 16 August 2017).
10. Priorities in Perinatal Care Association of South Africa. Perinatal priorities: Proceedings 2017. <https://www.perinatalpriorities.co.za/proceedings-database/> (accessed 25 September 2017).
11. National Committee for Confidential Enquiry into Maternal Deaths. Saving Mothers 2011-2013: Sixth Report on the Confidential Enquiries into Maternal Deaths in South Africa: Short Report. <https://www.health-e.org.za/wp-content/uploads/2016/05/Saving-Mothers-2011-2013-short-report.pdf> (accessed 16 August 2017).
12. Oboirien KO, Harris B, Eyles J, et al. Understanding roles, enablers and challenges of District Clinical Specialist Teams in strengthening primary healthcare in South Africa. *S Afr Health Rev* 2015;45-56.
13. Wutzke S, Benton M, Verma R. Towards the implementation of large scale innovations in complex healthcare systems: Views of managers and frontline personnel. *BMC Res Notes* 2016;9:327-331. <https://doi.org/10.1186/s13104-016-2133-0>.

Accepted 26 September 2017.