

Fit for purpose? A review of a medical curriculum and its contribution to strengthening health systems in South Africa

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Background. Medical education in the 21st century needs to produce health professionals who can respond to health systems challenges and population health needs. Although research on medical education is increasing, insufficient attention is paid to the outcomes of medical training, in particular graduates' competencies and the effects of their training on healthcare and population health in Africa.

Method. This baseline study assessed whether the current Stellenbosch University medical curriculum enabled graduates to acquire health systems strengthening competencies. The teaching of competencies in public health, evidence-based healthcare, health systems and services research, and infection prevention and control was assessed through a document review of study guides and a survey of recent medical graduates.

Results. We found that teaching of most competencies was included in the curriculum, but appeared fragmented with a lack of continuity across phases of the curriculum. Health systems and health leadership and management teaching was weak, and important public health competencies in human rights and health advocacy received little attention. Recent graduates said their training was 'adequate', but were unable to apply knowledge and skills to address health systems challenges within working environments. They wanted more integrated, practical, problem-based teaching in environments in which they would one day work, and their teachers to be role models for the competencies students were expected to acquire. This study is contributing to improvements to the medical curriculum at Stellenbosch University.

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Medical education in the 21st century needs to produce health professionals who can respond to changing epidemiological profiles, health systems challenges and population health needs. This requires a shift from the 20th century 'science-based' to a 'competency-based' curriculum to integrate education with health systems and produce graduates who can contribute as change agents within health systems.^[1]

Greater social accountability of medical schools 'to direct their education, research and service activities towards addressing the priority health concerns of the community, region and the nation that they have a mandate to serve'^[2] can deliver high-quality education which produces graduates who are more responsive to societal needs.^[3] Social accountability now forms part of accreditation of medical education institutions in the USA, and has growing recognition globally.^[4,5] Medical curricula are shifting fundamentally to focus on transformative learning, which seeks to change not only the knowledge of the student, but 'involves experiencing a deep, structural shift in the basic premises of thought, feelings, and action' to better enable graduates to respond to their context.^[1,6]

Despite these developments, advances in medical education in low- and middle-income countries have focused more on clinical competencies,

and less on the impact on health systems or population health.^[7] This lack of integration of medical education with societal needs is evident in sub-Saharan Africa (SSA), where the production of specialist skills and global competitiveness of graduates rather than local population needs has informed the medical curricula.^[4] Positive developments in medical education in SSA have been the increasing student numbers, as well as innovations such as community-based education (CBE) and problem-based learning (PBL) in a few countries.^[8-10] However, little attention has been paid to graduates' competencies, or the impact of medical training on health systems performance and population health in Africa. To achieve such outcomes, greater emphasis needs to be placed on health systems strengthening and public health competencies as part of transformative learning.^[11,12]

The Faculty of Medicine and Health Sciences (FMHS) of Stellenbosch University (SU) graduates approximately 200 doctors annually, and seeks to continually improve its curriculum to respond to the burden of disease and health system in South Africa (SA) and Africa. The FMHS initiated CBE in the 1990s, which was gradually expanded over the next two decades. By 2011 longitudinal training exposures had been implemented in the Ukwanda Rural Clinical School, and in 2013 SU adopted a graduate

attributes framework for the curriculum.^[13,14] Teaching on evidence-based healthcare (EBHC), recognised as essential for effective clinical practice and improvements in quality of healthcare, and infection prevention and control (IPC) are also being introduced into the curriculum.^[15,16]

Within this context the SU Rural Medical Education Partnership Initiative (SURMEPI) conducted a baseline review of the medical undergraduate curriculum, using public health (PH), health systems research (HSR), EBHC and IPC as 'tracers' for relevance to health systems strengthening and population health. This review sought to inform curriculum development towards producing graduates who are 'change agents' within the health system. This article reports the findings of the baseline review and reflects on its implications for curriculum change.

Methods

We assessed whether the SU medical curriculum in 2011 enabled graduates to acquire competencies to contribute to health systems strengthening. We firstly defined key PH, HSR, EBHC and IPC competency categories and competencies required for medical graduates. Our definition of competence aligned with the evolving emphasis in medical training on competencies as 'multi-dimensional, dynamic, developmental, and contextual' rather than the narrow measurement of specific actions.^[17] Competencies in PH, HSR, EBHC and IPC required by medical graduates were identified through a review of the international literature, workshops and consultations with experts. We then reviewed the content and planned outcomes of the curriculum as documented in 64 theoretical and clinical rotation study guides (2011 version) to assess the extent to which it addressed these competencies (Table 1). The guides detail the objectives, outcomes, assessment methods, and relevant course outlines, providing an overview of the structure of the 6-year medical curriculum. The research team included medical educators and researchers in PH, HSR, EBHC, and IPC from the SURMEPI project. A standard data extraction form was developed to capture relevant data including objectives, outcomes, teaching and assessment methods for PH, HSR, EBHC and IPC. Pairs of trained data collectors captured the data independently. Differences were resolved by rechecking the module guides, and discussing with a third reviewer. We

analysed the data according to three phases of the medical curriculum, Phase I corresponding with the first 'pre-clinical' year, Phase II the 'clinical phase' from years 2 to 5, and Phase III the student internship from years 5 to 6. Standard formats for reporting the results enabled comparisons of the results of PH, HSR, EBHC and IPC, and checking reliability of the data.

Finally, we asked recent graduates whether their training equipped them to function in and contribute to the health system. An electronic survey, which included Likert scale and open-ended questions on PH, HSR, EBHC, and IPC, was emailed to all recent medical graduates between 2004 and 2010 for whom contact details were available. Email reminders were sent and a prize offered as an incentive to participate. Quantitative data from the survey were analysed using SPSS statistical software. Qualitative results were analysed by each team (PH, HSR, EBHC and IPC) using ATLAS.ti. One researcher per team coded all the open-ended feedback, and another coded 25% of the same data. Data were compared and where 90% or more were similarly coded, the first researcher's coding was accepted. Where less than 90% correspondence occurred, the second researcher also coded the whole document and consensus was reached via discussion.

Permission to conduct the study was obtained from the FMHS MB,ChB Programme Committee, and ethics approval from the FMHS Ethics Review Committee (reference numbers N11/07/205 and S11/10/004).

Results

The PH, HSR, IPC and EBHC competency categories and competencies identified for undergraduates in Table 1 were used for the document review of the 2011 medical curriculum study guides.

Document review

Of the PH, HSR and EBHC enabling competencies, epidemiology, biostatistics and health-seeking behaviour were taught at an introductory level in the preclinical year. Demography, determinants of health, human rights and health leadership and management were not covered in this phase. During Phase II and III most of the PH competencies with the exception of PH aspects of human rights were taught, and students were expected to apply skills in projects in primary healthcare facilities and communities. Little

Table 1. Summary of competency categories and competencies used for the document review

PH	HSR	EBHC	IPC
Philosophy and principles of public health and primary health care	Enabling competency categories	Enabling competency categories	Standard precautions
Demography	Clear communicator	Biostatistics	Transmission-based precautions
Human rights	Ethical and socially responsible	Epidemiology	Aseptic procedures
Epidemiology, biostatistics and disease surveillance	Critical thinker	Principles of searching electronic databases	IPC policies and guidelines
Environmental and occupational health	Problem-solver	Philosophy of critical enquiry	IPC patient communication and education
Health-seeking behaviour and health promotion	Effective worker		
Health leadership and management	Interdisciplinary		
	Key HSR competency categories	Key EBHC competencies	
	SA and international health systems	Ask/phrase clear questions based on area of uncertainty	
	Determinants of health	Access/find relevant research evidence	
	Health research methods	Appraise/assess the validity and interpret the evidence	
	Health economic theory	Apply/assess the applicability to the local setting	
	Organisational theory		
	Evaluation methods		

teaching on health systems or health leadership and management was documented, and appeared late in the curriculum. Research methods taught did not include qualitative research, evaluation methods or other HSR methods.

Overall, there was a gap between learning in Phase I where knowledge of some PH and HSR competencies is introduced, and Phase III when students are expected to apply skills. All the PH and HSR teaching occurred in modules organised by Community Health and Family Medicine disciplines, with no documented teaching of any of these competencies in the clinical disciplines. The teaching was however fragmented with little evidence of a progression in levels of learning between the phases as assessed by the stated learning objectives and outcomes for PH and HSR competencies identified in the module guides.

Similarly, teaching of EBHC competencies was fragmented across the curriculum. Key competencies were covered in Phases II and III, although overall, the bulk of EBHC learning occurred in Phases I and III. There was no evidence of EBHC teaching in most theoretical and clinical modules of Phase II, which ran over more than half of the curriculum. We found evidence of only two EBHC tasks where students were required to apply the whole EBHC process. Both these tasks were within the combined Community Health and Family Medicine rotations. Teaching in IPC was also fragmented across the 6-year curriculum with most teaching located in the preclinical or early clinical phases. IPC teaching in the student internship was limited, at a time when students had greatest clinical exposure and IPC knowledge and skills were of immediate relevance. There was a disparity in the teaching time allocated across the IPC competency areas, with relatively little input

on standard and transmission-based precautions. Teaching on IPC-related communication and education of patients occurred in the first year of study, and was not taught in any modules subsequently.

Detailed findings on the results on PH, HSR, EBHC and IPC are reported separately.^[18-21]

Graduate survey

We emailed an internet survey link to 842 (86%) of the 980 doctors who graduated between 2004 and 2010. A total of 788 emails (94%) were delivered successfully, and 375 (38%) responses received. The respondents included medical officers (28.5%), registrars (24.3%), interns (14.2%), community service doctors (13.5%), and general practitioners (13.2%). Respondents were evenly distributed by year of graduation, ranging from a low of 10.8% of respondents having graduated in both 2004 and 2007, to a high of 18.5% graduates from 2005. Data were not available on the profile of the graduates on the contact list to assess whether the respondents were representative of all graduates.

Most respondents agreed on the importance of PH, HSR, EBHC and IPC in the medical curriculum, and that their PH, EBHC and IPC teaching was adequate to prepare them for practice, but disagreed that the HSR teaching was adequate (Table 2). They felt that PH, EBHC and IPC competencies were covered to a basic or adequate extent and a few thought they were covered comprehensively, whereas the HSR competencies were covered at a basic or an inadequate level.

Their responses to the open-ended questions, however, indicated that they lacked adequate skills to practise PH, HSR, EBHC and IPC, and encountered many PH and health systems problems for which

they felt unprepared. Graduates recommended that PH, HSR, EBHC and IPC teaching should be integrated into clinical teaching, making use of relevant examples in different disciplines. More practical training was needed in the environment in which they would work, investigating real-life problems and finding contextual solutions including case-based scenarios.

'More practical. At the time we did it, it felt a bit out of place. Now with more experience behind me I realise the value but it needs to be done in a certain context.'

'To integrate EBHC into clinical practice. Students must be encouraged to use EBHC during their clinical blocks for effective management of patients.'

'SU training gives one enough background about all aspects of IPC. However it does not emphasise why IPC is essential in healthcare and does not leave one with the practical skills needed to recognise a problem and address it effectively.'

'More practical scenarios with possible challenges that would be faced in the workplace.'

Overall the graduates felt that these topics were a low priority in the curriculum.

'More "in-service" training. Primary healthcare took a background position during our studies because there were always more "important" subjects to study for.'

'We had a short Public Health module and the seriousness of Public Health was not sufficiently transferred during that time.'

There were few 'role models' among their teachers. Sub-optimal IPC practices in teaching facilities and poor attitudes to IPC among senior staff members needed to be addressed:

Table 2. Recent medical graduates' views on the undergraduate curriculum

Statement	Discipline	Responses n (%)						Total
		Agree totally	Agree quite strongly	Agree	Disagree	Disagree quite strongly	Disagree totally	
It is important to learn EBHC/HSR/IPC/PH in the undergraduate curriculum	EBHC	104 (46.8)	64 (28.8)	53 (23.9)	1 (5)	0 (0)	0 (0)	222
	HSR	46 (24.5)	47 (25.0)	81 (43.1)	10 (5.3)	1 (5)	3 (1.6)	188
	IPC	109 (60.2)	41 (22.7)	31 (17.1)	0 (0)	0 (0)	0 (0)	181
	PH	80 (45.7)	43 (24.6)	50 (28.6)	1 (6)	0 (0)	1 (6)	175
Training at SU prepared me well for practising EBHC/HSR/IPC/PH in SA	EBHC	32 (14.4)	65 (29.3)	95 (42.8)	27 (12.2)	3 (1.4)	0 (0)	222
	HSR	6 (3.2)	33 (17.5)	63 (33.3)	67 (35.4)	14 (7.4)	6 (3.2)	189
	IPC	39 (21.8)	54 (30.2)	65 (36.3)	17 (9.5)	4 (2.2)	0 (0)	179
	PH	20 (11.2)	50 (27.9)	83 (46.4)	23 (12.8)	3 (1.7)	0 (0)	179

'Our academic teachers need experience in the new health system to effectively teach students what a systematic approach to holistic care means.'

'Do as I say, not as I do. We had quite a few theoretically sound lectures, but none of those measures were applied consistently in practice – particularly relating to TB infection control, the examples set were disastrously inadequate and even misleading.'

Poor management in the health system emerged as an obstacle which they felt unable to influence. They experienced a disconnect between clinical staff and management, and did not know how to escalate problems to a higher level and to find solutions. Their attempts to address health systems challenges were impeded by a complex mix of problems, including resource constraints, resistance to change by managers and senior doctors, lack of support and limited access to quality data.

'The problem in South Africa with the Health Systems is much (sic) complex, it is to deal with people, human interaction, managerial skills and leadership.'

'Management skills – a very large part of the doctors' job in a hospital setting is being able to manage different role players appropriately and effectively.'

The young doctors expressed the need for more data analysis skills, but had difficulty accessing information, whether it was facility and community data, or information needed for EBHC.

'We need demographic-specific analysis and interpretation skills.'

'Access to data regarding the community, like those we used in our Family Medicine projects.'

'Finding evidence in a quick and simple way.'

'Need easier access to data in a clinical setting.'

'Lack of hard- or software in government facilities.'

They also found it difficult to adapt to the different cultures and health-seeking behaviour of communities around the country, and this negatively influenced their ability to practise health promotion.

'We need to know better how to collaborate with the community on health issues.'

'Not having an understanding of my patient's culture and needs.'

'In a country with so many different cultures and cultural norms depending on where you work in the country, having an understanding of the indigenous culture where you are working would help a great deal (especially with the transient culture of the internship and community service years).'

Other specific obstacles they identified as barriers to practising EBHC included a lack of EBHC skills, self-motivation, and difficulty applying evidence in practice and the work environment.

'Managing patients in a way you know (based on evidence) is substandard but your superiors insist that based on their experience the status quo is what should be kept.'

The main obstacles to effective IPC implementation cited were lack of leadership and management support of IPC, financial, human resource and structural challenges, and an adverse institutional climate. They expressed a need for enhanced knowledge and skills in personal

protection, patient management and IPC programme design and evaluation.

Despite the challenges they faced in the health system, young medical graduates expressed a commitment to working in SA.

'Possibility to make a contribution to the community and give health to people with challenging socioeconomic circumstances.'

'The knowledge that small, well-planned interventions can make a huge difference. Health problems in South Africa's public sector are mostly preventable and treatable.'

'My patients, the beautiful surroundings in rural areas, the successes that can be achieved (e.g. ARVs). YOU can make a difference – just one doctor.'

Discussion

We were able to identify key competencies relevant to medical graduates in our context which may be relevant for other low- and middle-income countries. The strengthening of these PH, HSR, EBHC and IPC competencies in the undergraduate curriculum is an important mechanism to produce doctors who are change agents within the health system.^[14]

The document review found that most of these health systems strengthening competencies were taught to some extent, but teaching was fragmented, with a lack of continuity and progression of learning across the curriculum. Key competencies were introduced late, with limited documented opportunities for experiential learning, and little integration into clinical teaching. Teaching in health systems and health leadership and management was weak and important competencies in PH-related human rights and health advocacy received little or no attention. Medical training should develop 'social responsibility' in graduates, and a weak foundation in these areas is a serious limitation in their training.^[22]

The young doctors' perspectives confirmed the document review findings and provided further insights. Although most indicated that their training in PH, EBHC and IPC was 'adequate', their inability to apply the knowledge and skills within a working environment emerged strongly in the open-ended questions. The numerous workplace challenges identified as obstacles in the health system are precisely the challenges which competencies in PH, EBHC and HSR should enable them to address.

The graduates wanted more teaching of health systems, leadership and management, problem-solving and teamwork, which needed to be more integrated, practical and use problem-based teaching in PH, HSR, EBHC and IPC. This was not surprising given the burden of disease, health system challenges, and daily exposure to infectious diseases in healthcare in SA.^[23] They wanted their teachers to be role models for, and greater importance to be attached to these competencies in the curriculum.

Practice-based teaching and integration of PH, EBHC, IPC and HSR into the clinical curriculum is strongly advocated elsewhere and has been shown to improve knowledge, skills, attitude and behaviour.^[24,25]

Lastly, implementing changes in curricula requires leadership, resources and a willingness to participate. The redesign of the undergraduate medical curriculum to increase community-based practical learning in Brazil encountered numerous challenges, including resource constraints, insufficient number of facilitators, and limited capacity and confidence of clinical staff to facilitate the learning of PH.^[26] Similar barriers to the use of evidence-based medicine by GPs were reported in a systematic review.^[27]

Limitations

The document review depended on the completeness and accuracy of the information in the 2011 medical study guides. The graduate survey response rate was low (38%) but within the acceptable range for academic surveys.^[28] Selection bias may however have resulted in the graduate survey respondents differing from the population of recent graduates in ways which we were unable to measure. Despite these limitations, the study provides important insights for curriculum development at SU, and is informing the redesign of the undergraduate curriculum to improve the teaching of PH, HSR, EBHC and IPC to equip SU graduates to work in and strengthen the health system.

Implications for practice and research

Teaching of PH, HSR, EBHC and IPC competencies should be offered in an integrated manner in the curriculum, providing more opportunities for experiential learning in the contexts in which students will work after graduation. Graduates' recommendations for more innovative approaches to teaching, use of technology and facilitating peer learning have been successfully implemented in other settings.^[1,10,11] Faculty development is essential to increase experiential and other innovative learning approaches, and to strengthen content expertise in 'health systems strengthening' across disciplines in order to teach a new generation of health professionals.^[7,15] Strong faculty leadership is needed to promote co-operation across medical disciplines in the development and delivery of transformative teaching and learning.

We found few studies of evaluations of medical curricula in low- and middle-income countries, and little guidance on methods for such assessments. Further studies are required to develop robust methods to inform decision-making on the training of health professionals to promote social accountability and strengthen health systems in Africa.

Conclusion

Young medical graduates expressed a commitment to working in SA, but were frustrated by system problems encountered in the working environment and their lack of skills to overcome such challenges in the health system. It is incumbent on medical schools and their teachers to guide and equip graduates with competencies to function effectively in and contribute to strengthening health systems in these challenging circumstances.

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