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Exploring doctors' trade-offs between management, research and clinical training in the medical curriculum: a protocol for a discrete choice experiment in Southern Africa

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ABSTRACT

Introduction Medical curricula should prepare doctors for roles that extend beyond that of a clinician. But the formal inclusion of both management and research training still appear to be neglected. It is important to understand what the profession would be willing to give up in terms of clinical training time for management and research content teaching prior to making any changes in a medical curriculum.

Methods and analysis A discrete choice experiment will elicit the preferences and trade-offs that medical doctors in Southern Africa are prepared to make about the management, research and clinical training. Attention will also be given to the teaching method and placement of the content. DCE data will be collected using an online survey with an estimated sample size of 368 medical doctors. Data regarding participants' preference for a traditional or revised curriculum will be assessed using the Resistance to Change-Beliefs (RC-B) scale and demographic information will also be collected to assess preference heterogeneity.

Analysis of the DCE data will be based on the Random Utility Maximisation framework using variants of the multinomial logit model. Data quality will be assessed. Value will be estimated in terms of clinical time, that is, how much clinical training time medical doctors are willing to give up to have research and management training within a curriculum that has a maximum of 40 hours per week. Observed preference heterogeneity will be assessed using the RC-B scale data and characteristics of respondents. Latent class models will be used to test for unobserved heterogeneity.

Ethics and dissemination The research ethics and institutional committees of the sites have approved the study. The survey includes an informed consent section. Study findings will be reported to the medical schools and papers will be submitted to peer-reviewed, accredited journals and higher education and health economic conferences.

STRENGTHS AND LIMITATIONS OF THIS STUDY

⇒ The attributes and levels for the discrete choice experiment have been developed from literature reviews, qualitative research, think-aloud interviews with medical doctors and a quantitative pilot study.
⇒ A step-by-step warm-up choice task where participants are guided through a choice task will be included to help respondents understand the choice tasks.
⇒ A Resistance to Change-Beliefs scale will be incorporated to assess respondents' preference for maintaining tradition or implementing change.
⇒ The study will be conducted in Southern Africa and findings may not be generalisable to the curriculum design of other medical schools.
⇒ It has not been feasible to incorporate all features of curriculum design that may influence preferences.

INTRODUCTION

The medical curriculum is all too often informed by historical content where clinical training surpasses any other topic or competency.[1–3] A recent qualitative research study of medical doctors and academic educationalists from four medical schools in Southern Africa found that the teaching of management, and to a lesser extent research, was ad hoc and unstructured.[4] There was consensus among participants that both need to be incorporated formally but that this would incur opportunity costs in terms of time taken away from clinical training.

Medical schools with large cohorts of students often need to balance the range of required exit-level competencies with learning outcomes at an appropriate time within a lengthy programme. Due to the initial pandemic lockdown responses to curb the spread of coronavirus, teaching models that went beyond the traditional face-to-face and online options, had to be implemented at all educational institutions, including medical schools. Therefore, there are more choices regarding curricula content, teaching

models and timing of inclusions in the curriculum than in the pre-pandemic environment.

Discrete choice experiments (DCE) elicit preferences about hypothetical goods, services or scenarios.[5 6] The method is attributes-based, and a key output is how individuals trade across these attributes, that is, how much of one attribute an individual is willing to give up to have more of another attribute. In medical education, DCEs have traditionally been used to inform the content and format of specific educational programmes; to better understand career preferences of doctors, alternative payment systems and to inform workforce planning.[7–10] For example, a DCE posed to final-year medical students in the UK to evaluate their preferences for the characteristics of training posts in terms of monetary value found that good working conditions were valued significantly more than other factors.[8] The DCE was able to elicit that a training post with poor working conditions had to offer salaries that are 44% higher than the average expected earnings if presented alongside a training post with excellent working conditions in order to be in contention.

Curriculum design is defined as the process of defining and organising content; teaching and learning strategies; assessment processes; and evaluation processes into a logical pattern.[11] This process requires alignment between agreed-on graduate attributes, pedagogy, learning outcomes, teaching methods, instructional design and stakeholder engagement to counter resistance to change, hence presenting potential attributes for choices in a DCE.[12–15]

Aims

We use a DCE to determine preferences of medical doctors in Southern Africa regarding the medical curriculum. We specifically explore the trade-offs between management, research and clinical training, that is, how much clinical training time from the current 40 hours per week respondents are willing to give up for the teaching of management and/or research content. To our knowledge this is the first study to use the DCE method to look at curriculum design.

METHODS AND ANALYSIS

Table 1 outlines the attributes and levels for the final DCE that were developed from literature reviews, qualitative research,[4] think-aloud interviews with medical doctors and a quantitative pilot DCE (n=41).

Management content

Concerns have been raised that basic (preclinical preparation) and clinical training alone are insufficient to prepare medical doctors for situations requiring managerial skills in complex health systems.[16–19] The identified levels are aligned to widely accepted competencies expected of healthcare professionals.[20 21] For example, one of the seven roles of the Canadian Medical Education Directives for Specialists framework used by medical schools globally, including Southern Africa, describes the abilities needed by doctors to deliver effective healthcare is that of the 'Leader'. This role describes key and enabling competencies at a societal, system and individual level that are similar to the levels described for this attribute.[21]

There are four levels with each subsequent level scaffolding onto the prior content: none; managing self (developing self-awareness, time management and recognising burnout in self); managing others (previous level content plus working with others and within teams, encouraging contribution and building and maintaining

Table 1 Attributes and levels for the discrete choice experiments

Attribute (regression label)	Short description	Levels (preference parameters)
Management content (manage)	The management knowledge and skills competencies considered of value in a medical curriculum.	None (reference) Managing self(β_1) Managing others (β_2) Managing the health system(β_3)
Research content (research)	The research knowledge and skills competencies considered of value in a medical curriculum.	None (reference) Using research(β_4) Doing research (β_5) Sharing research (β_6)
Teaching method of management and/or research content (method)	The teaching method that will be used for the specified content.	Face-to-face (reference) Online (β_7) Hybrid (β_8) HyFlex (β_9)
Placement of management and/or research content (placement)	Placement in the curriculum where management and research content can be taught and assessed.	Beginning (reference) Middle (β_{10}) End (β_{11}) Throughout (β_{12})
Clinical training in a week (clinical)	The number of hours for clinical training in a week.	(β_{13}) 28 hours 31 hours 34 hours 37 hours

relationships); and managing the health system (previous level content plus improving health services and patient safety, being aware of health financing, the role of budgets in the health system and encouraging improvement and innovation).

Research content

Although most medical curricula incorporate formal training on basic research skills, there are still challenges such as limited teaching time and the availability of appropriate research mentors that limit the expansion of training for higher-order competencies.[22 23]

The four levels are described as: none; using research (understanding and using research methods and basic statistics, appraising journal articles and web-based information); doing research (previous level content plus doing a research protocol—including literature review—and being involved in a research project); and sharing research (previous level content plus submitting a research output to appropriate student research platforms, eg, to conference, faculty research events). The final level is aligned to the scholarship of application/engagement described in Boyer's model of scholarship that expands the traditional definition of scholarship and research.[24]

Clinical training hours in a week

We included clinical training hours in a week to estimate how much time respondents would be willing to give up in terms of hours from the current 40 hours clinical training to be used for management and/or research training instead. It is acknowledged that the use of clinical training time as a surrogate for adequate clinical skills achievement is not an appropriate measure of clinical training. However, clinical training time and skills acquisition is not the focus of the study. The use of the attribute is to assess the trade-off that participants would be prepared to make for management and research training using the DCE.

The range of levels in the quantitative pilot study were 32, 34, 36 and 38 hours. Analysis of the quantitative pilot data (see online supplemental material 1) suggested these levels did not push individuals to their maximum: estimates of willingness to give up lacked face validity, with values being higher than the levels included in the DCE; only 3% of responses were for the current situation of 40 hours per week of clinical training; modelling the cost attribute as non-linear (dummy variable) indicated 32, 34 and 36 hours were not seen as significantly different and results from the contingent valuation suggested a maximum of 10 hours. We thus revised the levels to 28, 31, 34 and 37 hours for the main study.

Placement of management and/or research content in curriculum

As undergraduate medical curricula differ in the length of their degree programmes, the following levels were developed: beginning (the junior years), middle (the intermediate years), end (the senior years) and throughout or longitudinal (all the years).

Teaching method of management and/or research content in curriculum

In light of the major educational changes that were implemented at the start of the COVID-19 pandemic, an education innovation expert was consulted about the appropriate descriptions of different teaching methods. The descriptions from the Cengage Group[25] were adopted for the DCE: synchronous learning (face-to-face), asynchronous learning (online), hybrid learning (a combination of synchronous face-to-face and asynchronous online learning) and the HyFlex model (students move between a completely online version of a class and a completely synchronous version of the same class to meet their individual learning needs).

Experimental design and construction of choice tasks

For the quantitative pilot survey, a main-effects efficient design with two alternatives (curriculum A, curriculum B) and 16 choice tasks were generated using Ngene.[26] Given no prior information about doctors' preferences for a medical curriculum, null priors were assumed.

A status quo/current situation was added to the two options to allow for the realistic scenario that some doctors may not want to give up any clinical training time for management and research training.

Two repeat choices (choice task #4 and #8) were included to test for data quality and information collected on time to complete the survey.

Box 1 below shows the context of the choice and figure 1 below an example choice.

Developmental work suggested that 18 choice tasks were too many and would deter completion of the survey. Two blocks of 10 tasks were developed to reduce cognitive burden and encourage survey completion as tests for internal validity.[5 27 28] Therefore respondents in the quantitative pilot survey were allocated to one of the two blocks to complete 10 choice tasks.

Box 1 Choice context for the discrete choice experiments choices

Imagine you are the newly appointed Dean of a medical school in Southern Africa. A committee has been working on revising the undergraduate medical curriculum to train doctors. The current curriculum has 40 hours of clinical activity time in a week.

You are presented with options for teaching **management and research content** in a generic programme of 40 hours/week. The **clinical activity time** in a week (in hours), **teaching method** and **the placement of the subjects in the curriculum** is also presented.

You must make a choice of a medical curriculum based on the options shown to you. Assume that all other factors are the same across the curricula.

Which medical curriculum would you choose for your medical school?

	Curriculum A	Curriculum B	Current situation
Management content	Managing others	Managing the health system	None
Research content	Using research	None	None
Clinical training (hours in a week)	32	38	40
Placement of management and research content in degree	Throughout	Middle	
Teaching method of management and research content	Online	HyFlex	
Which medical curriculum would you choose?	**A** ☐	**B** ☐	**C** ☐

Figure 1 An example of a choice task.

Questionnaire design

The online DCE survey was developed using SurveyEngine.[29] We first include questions to introduce respondents to the DCE attributes.

To help respondents understand the choice tasks respondents were presented with a step-by-step warm-up choice task where participants are guided through a choice task (see online supplemental material 2 for more information on this instructive guide).

Resistance to change is often encountered when revising medical curricula. A validated Resistance to Change-Beliefs (RC-B) scale will be included to explore respondents' preference for maintaining tradition or implementing gradual change (see online supplemental material 3 for more information on the RC-B scale).[14 15 30] Our a priori hypothesis is that respondents who would be willing to give up clinical training time for the inclusion or expanded inclusion of management and research would prefer implementing change.[31] Information will also be collected on respondents' age, year of graduation from the medical degree programme, general location of the medical school, general description of the participants' work environment and additional qualifications.

To establish the levels for the time attribute, respondents were also asked a contingent valuation question in the pilot DCE to indicate the maximum number of hours (from a 40-hour per week of clinical training) that they would be willing to give up to have training for management and research, respectively.

Participant identification, recruitment and sample size

The target population for the DCE survey is registered medical doctors in Southern Africa. In compliance with the Protection of Personal Information Act,[32] organisations who deal with the interests of medical doctors will be approached for approval to distribute the survey link to their members. An estimated 10 000 registered medical doctors who have completed their first year of medical work following graduation will be invited to participate. Participants who consent to providing their email addresses and complete the survey will be included in a lucky draw for a £50 online voucher for an online medical supplies store.

Formal sample size calculation for the DCE is difficult due to a lack of prior information on preferences. We use the framework suggested by Orme[33 34] for a sample size calculation: $n=500c/(ta)$ where n is the required sample size; c is the largest number of levels for any one attribute; t is the number of choice tasks; and a number of alternatives per task. Applying to our DCE: five attributes; with a maximum of four levels, and using eight choice sets with three alternatives, requires a sample size of 83. Due to the wide range of rates associated with data quality issues,[35] we use an estimate of 10% for respondents that may need to be excluded; this would require a minimum sample size of 92 respondents. Due to the block allocation, this estimate is doubled to 184. Given we will explore heterogeneity of preferences we double this to 368.

Patient and public involvement

Only participants as outlined in the Methods section were involved in the design, or conduct, or reporting, or dissemination plans of this research.

Data analysis

The data will be analysed in Stata/IC V.17.0.[36] We use two criteria to assess data quality as respondents are answering hypothetical choices: (i) *Within-test stability*: Task #4 and #8 will be repeated and a discrepancy in responses will be recorded; (ii) *Response time*: We will compute the response time distribution for each choice task. If observed response time is below the first quintile value for more than 50% of choices the respondent will be defined as a 'speedster'. A data quality score will be generated for each respondent, ranging from 0 (when the participant passes the two tests) to 2 (when the participants fails the stability test and is a 'speedster'). Respondents will be defined as providing 'low quality data' if they have a data quality score ≥1. The model will be run with and without the 'low quality data' to assess the impact in sensitivity analysis.

Analysis of the choice data will be based on the Random Utility Maximisation (RUM) framework[37] using variants

of the multinomial logit regression technique. The RUM framework assumes respondents make choices described by:

$$U_{ntj} = V_{ntj} + \varepsilon_{ntj} \quad (1)$$

where, each respondent, n, will choose the intervention j in a choice task t that provides him/her with the highest utility, U, that is, modelled using two components: (i) a systematic part, V, which is observable to the researcher based on the identified attributes, and (ii) an unobserved random component, ε.

The systematic part is described as a linear combination of a respondent's preferences (β_k) and levels of the identified attributes' levels (X_k) such that:

$$V_{njt} = \sum_k \beta_k X_{kjt} \quad (2)$$

where β are the parameter estimates for marginal changes in the levels (X) for the levels (k) described in table 1.

The utility function of the alternatives will be specified by:

$$\begin{aligned} U_{\text{Curriculum}} = {} & \propto_{Curriculum} + \beta_1.Manage_{Self} + \beta_2.Manage_{Others} + \\ & \beta_3.Manage_{Healthsystem} + \beta_4 Research_{Using} + \beta_5.Research_{Doing} \\ & + \beta_6.Research_{Sharing} + \beta_7 Method_{Online} + \beta_8 Method_{Hybrid} \\ & + \beta_9 Method_{HyFlex} + \beta_{10} Placement_{Middle} + \beta_{11} Placement_{End} \\ & + \beta_{12} Placement_{Throughout} + \beta_{13} Clinical + \varepsilon_{jn} \end{aligned} \quad (3)$$

where the alternative specific constant (asc), $\propto$, captures the general preference for the current situation (curriculum): if positive, a movement away from the current situation is preferred; if negative the current situation is preferred. Variable labels are defined in table 1. All categorical variables (Management, Research, Method and Placement) will be dummy coded, indicating the general preference to move from the (current) reference category (captured in the asc) to the defined level being valued.[38] Clinical activity time, *clinical*, will be a continuous variable.

Assuming a linear model, the trade-offs that respondents make between any two attributes, known as marginal rates of substitution, will be calculated from the ratio of the relevant regression coefficients.[39] For example, the ratio of the coefficient on managing self (β_1 to clinical activity (β_{13}) indicates how much clinical activity (in hours) respondents are willing to give up to move from the reference level of zero management content to the first level. Similarly, the ratio of β_2 / β_{13} indicates how much clinical activity (in hours) respondents are willing to give up to move from the reference level of zero management content to the second level of managing training (managing others). This information can be used to estimate how much more clinical training time respondents are willing to forgo to have management training that incorporates working with others and within teams rather than focusing on self-management: $(\beta_2 - \beta_1) / \beta_{13}$.

Observed preference heterogeneity will be assessed using interaction terms for the RC-B scale data and reported characteristics of respondents. Latent class models will be used to explore unobserved heterogeneity.

Ethics and dissemination

Ethical approval was obtained from all study sites (Health Research Ethics Committee, Faculty of Health Sciences, University of Pretoria: 277/2020; Sefako Makgatho Health Sciences University: 277/2020; Health Research Ethics Committee, Stellenbosch University: S20/06/152 and the Office of Research and Development, University of Botswana Institutional Review Board: UBR/RES/IRB/BIO/GRAD/218). Written informed consent was obtained for the participation and audio recording of all interviews as well as reporting of anonymised, de-identified data.

In order to distribute the DCE online survey to medical doctors, permission will be obtained from organisations who deal with the interests of medical doctors in Southern Africa. Informed consent will be included in the online survey.

Study findings will be reported to the medical schools and papers will be submitted to peer-reviewed, accredited journals and higher education and health economic conferences.

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Patient and public involvement Patients and/or the public were not involved in the design, or conduct, or reporting, or dissemination plans of this research.

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Data availability statement The pilot study data is available as supplementary information. Data collection is still in progress for the study.

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