Global Health Competency Skills:

A Self-assessment for Medical Students

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ABSTRACT

Global health is an emerging concern in a rapidly changing world in which health issues transcend international borders. This study developed and validated a new self-report questionnaire to assess self-perceived global health competencies among international medical students and how they are influenced by international clinical experiences. A tool consisted of two scales and four subscales with moderate internal consistency.

Comparisons between participants who completed retrospective pretest (after the intervention retrospectively) and those who completed traditional pretest (before the intervention) revealed that those participants who completed the questionnaires retrospectively provided lower pretest scores, suggesting that response-shift bias had occurred. Significant increases in scores after international clinical experience were reported for the majority of global health competency measures in IFMSA group. Linear regression identified participant's age, gross national income (GNI) of country of medical studies, GNI of the country visited, duration of international clinical experience and years of medical school completed, as significant predictors of global health scores.

This study contributes valuable information about the newly developed global health competencies measurement tool.

EXECUTIVE SUMMARY

Global health is a complex emerging field that incorporates concepts of international health and public health. It not only addresses international health concerns such as communicable diseases, but also local health concerns related to poverty and marginalization. Global health can be practiced locally by addressing worldwide concerns that impact health; namely poverty, access to health care and economic instability. Physicians play a crucial role in global health as they quickly need to adapt to changes caused by globalization (e.g. new diseases emerging, populations becoming more diverse with specific needs).

Medical students have recognized the importance of global health and are striving to learn more by engaging in variety of global health learning opportunities. A lot of their participation in global health activities is student-driven without faculty supervision; however universities are recognizing the great interest in global health by offering global health courses and international training opportunities (e.g. international clinical rotations).

The aim of this study was to evaluate the impact of international clinical experiences on global health role competencies and to identify potential facilitators and barriers to this experience. Since a relevant global health assessment tool was not identified, a new measurement tool was developed and validated. The questionnaire consisted of two sections that collected information about participants' characteristics and a section with a global health instrument.

As a foundation for global health instrument development, this study used the *Global Health Education in Postgraduate Family Medicine Training framework* developed by the Ontario Global Health Family Medicine Curriculum Working Group. This novel framework is aligned with CanMEDS key physician competencies (communicator, collaborator, manager, health advocate, scholar, and professional) which are at its core. The framework was seen particularly suitable for this study due to its emphasis on global health enhanced role competencies, global health values and principles, and curriculum delivery methods.

Study participants were recruited at a meeting facilitated by International Federation of Medical Students' Associations (IFMSA), and an additional sample was recruited through University of Ottawa pre-departure training. IFMSA study participants were on average 23 years old, mainly females (56%) from high income countries with gross national income (GNI) greater than $12,275 (61.3%), they spoke two languages (50%), and attended the third or fourth year of medical school (45%). The majority (69%) did not participate in international clinical experience. Those with international experience had one such experience that lasted between one and two months. The main barriers to international clinical experiences reported by IFMSA study participants without international clinical experience were lack of opportunities, financial reasons, and time.

Exploratory factor analysis performed on the global health competencies measurement instrument provided valuable information about the structure of the instrument's scales and subscales (two scales and four subscales were suggested). Their internal consistency measured with Cronbach's alpha ranged from 0.61 to 0.71

suggesting moderate reliability. Group differences between study participants who completed pretest questionnaire retrospectively (IFMSA study participants) and participants who completed traditional pretest before the intervention (University of Ottawa participants) were examined. This analysis revealed higher traditional than retrospective pretest scores suggesting response-shift bias.

Differences in before and after international clinical experience scores were evaluated on the IFMSA sample and an increase in the majority of global health scores was detected after an international clinical experience. Furthermore, multiple linear regression found that participant's age, GNI of country of medical studies, GNI of the country visited, duration of international clinical experience and years of medical school were significant predictors of certain global health scores.

This study contributes novel information about the newly developed global health competency assessment instrument. Moreover, the findings support the hypothesis of usefulness of international clinical experiences for the improvement in global health competencies; however due to design and sample size limitations further research is needed.

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Chapter 1 Thesis rationale and outline

1.1. Rationale

Global health, a concept that integrates public health and international health, is an emerging concern in a rapidly changing world (1). Both communicable and non-communicable health concerns transcend national borders and can be found in all parts of the world. Therefore, it is vital to prepare future physicians to be competent medical practitioners in different settings and with diverse populations. This study explores development of a self-assessment global health competencies measurement tool and evaluates findings from a global health survey completed by medical students, members of the International Federation of Medical Students' Associations (IFMSA).

1.2. Thesis outline and objectives

This thesis is divided into eight chapters that discuss the background information, design options, analysis, results, and recommendations. Additional materials can be found in the appendices and it includes information about global health programs in Canada, global health and medical education frameworks, the questionnaire developed, ethics approval and supplementary information about the study.

The following objectives are explored in the thesis chapters:

Chapter 1

The introductory chapter presents the thesis outline with the content of each chapter.

Chapter 2

This chapter describes the concept of global health and the importance of global health in medical education. It further explains CanMEDS physician competency framework which is widely used in planning medical curricula and the importance of global health evaluation tools.

Chapter 3

Study designs considered for this study are described in this chapter. The designs explored include the Traditional Pretest/Postest design, the Retrospective Pretest/Posttest design and the Solomon four-group design.

Chapter 4

Chapter 4 explains methods used in survey development and the survey implementation.

Chapter 5

The reasons for participating or not participating in international clinical experience are explored in this chapter as well as the barriers to participating.

Chapter 6

Psychometric properties of the instrument developed can be found in Chapter 6.

Chapter 7

The difference in global health competency scores before and after international electives was evaluated in Chapter 7.

Chapter 8

Relationships between global health competency scores before and after international clinical experiences and the study participants' characteristics are described in this chapter.

Chapter 9

Chapter 9 presents a summary chapter with conclusions.

Chapter 2 Background

2.1. Global health – an emerging concern

Rapid economic development of the world, advancement of technologies, and ever greater migration of populations urges us to think about health in a global context (2). The term global health refers to a complex concept that incorporates public health and international health and is associated with both local and global health concerns (1). The *Global Health Education Consortium* (GHEC), a leading association of faculty and health care educators committed to promoting and integrating global health education in health professions training, defines global health as a subspecialty that relates to health issues and concerns that transcend national borders, class, race, ethnicity, and culture. It also requires collective action to deal with common health issues (3-5) According to Houpt et al factors that contribute to poor health such as restricted access to health care, conflicts, political and economic instability, and poverty are observed worldwide (3). Similarly, non-communicable diseases such as cardiovascular disease, smoking-related diseases, obesity, and mental disease are increasing in developing countries (6). One of the major objectives of global heath is health equity (7). The acronym 'PROGRESS' - Place of residence; Religion; Occupation; Gender; Race/Ethnicity; Education; Socioeconomic status (SES); and Social capital – highlights the multidimensionality of the distribution of health among various populations (7,8). Categorization of determinants of health is particularly important for design of interventions that will tackle them (8). Factors mentioned under

the acronym PROGRESS are associated with a degree of vulnerability of some populations. For instance, based on the place of residence, it could be that those who reside in poor areas are more prone to traffic injuries than those who reside elsewhere due to the use of safety measures such as crosswalks (7).

Canada is one of the key global health partners engaged in many global health initiatives. It is also one of the largest donors of international aid (9-11). In 2009, Canada's official development assistance (ODA) was 4.6 billion Canadian dollars or 0.30% of Canada's Gross National Income, and in 2010 Canadian ODA increased by 17.4% to $5.4 billion Canadian (11,12). Furthermore, Canada's commitment to help developing countries to achieve stability, health, and prosperity is incorporated in Canada's International Policy Statement (13).

The international community has also recognized global health as an important goal. At the *United Nations Millennium Summit* in 2000, 189 UN leaders met in New York to sign the *Millennium Declaration;* thereby committing their countries to reduce poverty and help develop initiatives for disadvantaged populations in order to make the world a more prosperous, healthier and peaceful place (14).

This initial commitment was further translated into eight *Millennium Development Goals* (MDG) to be achieved by 2015 (15). The international development plan encompasses the following objectives:

MDG 1: Eradicate extreme poverty and hunger

MDG 2: Achieve universal primary education

MDG 3: Promote gender equality and empower women

MDG 4: Reduce child mortality

MDG 5: Improve maternal health

MDG 6: Combat HIV/AIDS, malaria and other diseases

MDG 7: Ensure environmental sustainability

MDG 8: Develop a global partnership for development

Development goals (MDGs) were discussed in 2010 at the *G8 Summit* held in Muskoka, Ontario during which some of the strongest economies in the world met (Canada, the US, France, Italy, Germany, Japan, the UK, and Russia) (15). The outcome of the summit was the *G8 Muskoka Declaration – Recovery and New Beginnings* document, which highlights the importance of addressing global challenges and MDG goals (16). In his final *G8 Summit* statement, Canadian Prime Minister Steven Harper acknowledged the importance of MDG goals and Canada's commitment to continue assisting those in need (17).

While the term global health has international connotations; it also encompasses domestic concerns; it refers to a specific health concern observed in many countries globally as population's health is affected by the same phenomena – for example immigration or poverty (1,3). Health problems of the poor in high income countries are as concerning as health problems of low income country population where majority of the population is in a disadvantaged position (18). Health status of individuals follows a

social gradient. The poorest populations with low socioeconomic status regardless of the overall socioeconomic position of the country are particularly vulnerable, and they have the worse health (18). Therefore, addressing problems of the poor in high income countries has the same imperative as addressing problems of the poor in low income countries.

Populations that are identified as more vulnerable by using the acronym PROGRESS and that have poor indicators of health are of a particular concern in the field of global health (8,19). In the Canadian context, this includes vulnerable populations that live in poverty (10% of the Canadian population is considered low-income), homeless populations, Aboriginal peoples, people with disabilities, people with low literacy skills, refugees, and the elderly (20,21). Additionally, recent immigrants, who account for 20% of Canadian population, are another vulnerable group. A phenomenon called “healthy immigrant effect” is observed in this population – initially, newly arrived immigrants’ health is better than the health of Canadian-born residents, but with time immigrants’ health deteriorates (22,23). This could be due to cultural and linguistic barriers that immigrants have when accessing health care or pursuing better paid careers (24). Since specific expertise is needed to address the needs of vulnerable populations, global health is becoming an emerging concern in Canada.

2.2. Global health and medical education

Globalisation has major implications for medical doctors as populations become more mobile (6). Increasingly, more people travel and move around the globe and transfer various diseases across borders, prompting physicians to respond to new medical situations and to the needs of various population groups (25). Global health training of health professionals is important because it improves their communication skills, it teaches students to appreciate diversity, and it enables them to practice in diverse environments (26). Due to the increasing interest of medical students in providing high quality medical services to diverse populations, it is crucial that future physicians are well prepared for practising medicine in a global environment (27,30). However, although globalization has motivated physicians to receive specific training through global health programs, global health is generally still not a key component of the medical curriculum (28).

For example, global health topics receive little attention in North American medical school curricula; yet more than 20% of United States (U.S.) medical students participated in international health activities in 2003 (29,30). According to the Association of American Medical Colleges *GQ Medical School Graduation Questionnaire*, 67.6% of U.S. medical students will have chosen an elective or volunteer experience related to health disparities in 2011 compared to 45.6% in 2007 (31). During this period, an increase from 47.2% to 69.1% is also noted for students interested in experiences related to cultural awareness and cultural competence (31). Furthermore, the interest in global health experience increased from 26.3% to 30.5% between 2007

and 2011 in the U.S. (31). Gupta et al and Mutchnick et al indicated that those medical students who had international experience were more likely to choose a career path that involved working with disadvantaged populations such as immigrants and patients with low socioeconomic backgrounds (32).

Medical students are not the only ones who benefit from international electives. International electives have a positive impact on medical schools and the communities that welcome such initiatives (26). Medical schools profit from offering international electives as they attract more students, new medical curricula are developed and students have the opportunity to experience more diverse clinical practices (26). In order to help prepare physicians to meet the demands of an increasingly mobile global society and to satisfy student interests in obtaining global health experience, global health topics should be incorporated into the medical curriculum.

2.2.1. Global health education at Canadian medical schools

Canadian and international universities have recognized the importance of global health education as a part of the medical curriculum; however global health is still not a mandatory element of the medical curriculum. Nevertheless, medical schools in Canada have started to intensively create global health programs and opportunities to ensure that future physicians understand the concepts of global health (25,33-39). International electives are identified as one way of improving global health competencies. The participation of medical students in international electives has been encouraged and in some instances facilitated by Canadian medical schools (28,40-43). An overview of

global health programs available to medical trainees enrolled at Canadian universities about programs offered can be found in the *Appendix A*.

In their study about global health at seventeen Canadian medical schools, Izadnegahdar et al found that medical students in Canada have a growing interest in global health (28). Yet, there was a large heterogeneity in global health educational initiatives at Canadian medical schools. All medical schools permitted their students to engage in international electives; whereas the Northern Ontario School of Medicine enticed its students to participate in Canadian global health electives. Moreover, at some medical schools, global health topics were incorporated into modules such as tropical medicine or community medicine (28). Heterogeneity was also observed in support that students receive for their international rotations such as pre-departure training, funding opportunities or supervision overseas (28). At the time of the study, almost half of the schools allowed international electives without clear faculty supervision. Still, at many universities students formed global health groups that support and facilitate international electives (28).

2.2.2. Pre-departure training

Medical students should be properly prepared before departing for an international elective. Pre-departure training is recognized as a very important step in learning about global health in order to prepare students for clinical, ethical and cultural issues which may arise during international experience (44). The *Association of Faculties of Medicine of Canada* (AFMC), the *Canadian Federation of Medical Students*

(CFMS) and the *Canadian Association of Interns and Residents* (CAIR) published guidelines to prepare medical students and residents for their international experience (45,46). These guidelines highlight a proper pre-departure preparation that includes clarification of international experience objectives, personal and local population health concerns, travel safety, ethical concerns, and cultural competency, including language competency and cultural awareness. Yet, these pre-departure guidelines are not always implemented. In their 2008 survey, Izadnegahdar et al found that there is a great interest among Canadian medical students to learn about global health; however they concluded that Canadian medical schools were not well prepared to always implement pre-departure training, and that global health involvement often occurred without faculties' supervisions (28).

2.3. CanMEDs physician competency framework

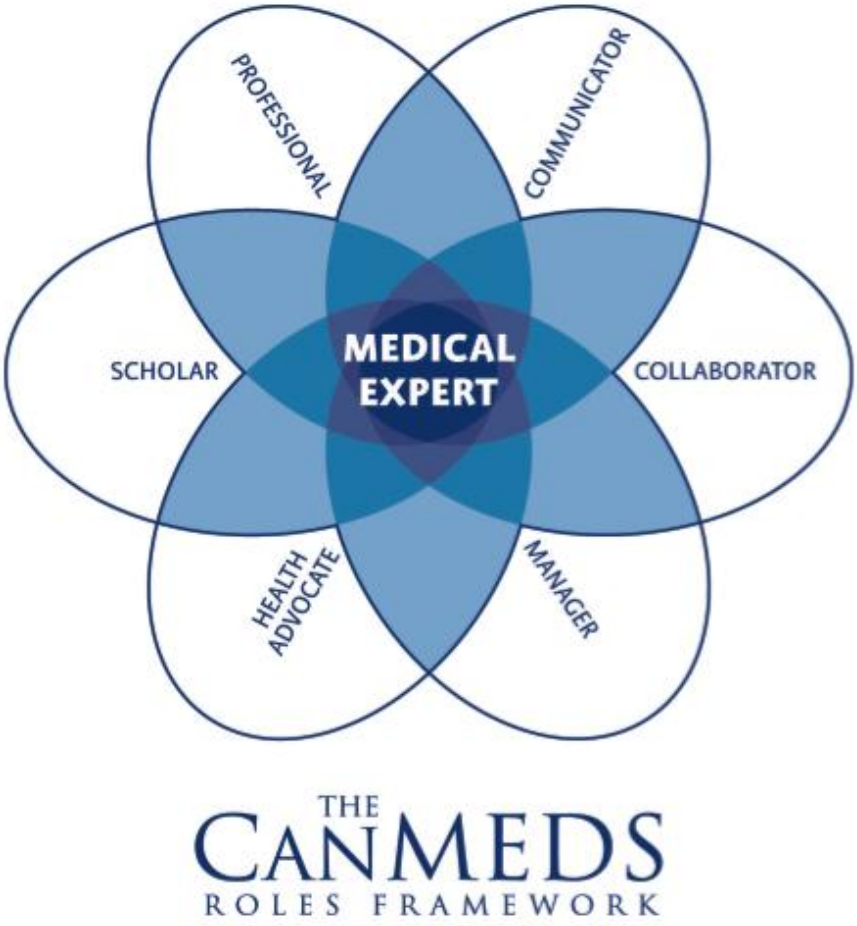
The Royal College of Physicians and Surgeons of Canada (RCPSC) established the Canadian Medical Education Directions for Specialists (CanMEDS) initiative in the 1990s in order to improve patient care (47). This initiative was a reaction to rapidly changing medical practice, an increase in medical knowledge, changing technology such as access to information via the internet, and growing patient consumerism (47). The Framework was embraced as an educational standard by many medical education programs in Canada (48-51). The RSPSC developed The CanMEDS Framework which specifies seven core competencies for medical education and practice: physician as a

communicator, collaborator, manager, health advocate, scholar, professional and medical expert (52).

According to the CanMEDS Framework, Canadian physician should be competent in the following roles (*Figure 2-1*):

- **Communicator** – physician is able to effectively communicate with patients, healthcare professionals and others involved in the patient's care
- **Collaborator** – physician is able to effectively collaborate with other team members in the best interest of patients
- **Manager** – physician is able to organize his or her medical practice in a sustainable way by appropriate allocation of resources and contributions to the healthcare system
- **Health Advocate** – physician uses his or her expertise by advocating for individuals, communities and populations in order to improve their health
- **Scholar** – physician commits to continuous learning and contributes to knowledge development, its application and translation
- **Professional** – physicians commit to practice medicine competently and respectfully while applying the highest ethical standards
- **Medical Expert** – all CanMEDS roles are integrated into the medical expert role (53).

Figure 2-1 The CanMEDS Framework (53)



2.4. Global health competency framework examples

Global health is not included in CanMEDS framework developed by the Royal College of Physicians and Surgeons of Canada (52). However, global health is recognized as an important part of the medical curriculum by Canadian Universities and there are attempts to integrate this concept in undergraduate and postgraduate medical training (33-37).

The *Global Health Education in Postgraduate Family Medicine Training framework* developed by the Ontario Global Health Family Medicine Curriculum Working Group is an example of an application of the CanMEDS framework applied to the planning of global health medical education (51). This global health framework was developed by six Ontario`s family medicine residency programs to guide design, development, delivery, and evaluation of interprofessional global health education (51). The framework is aligned with CanMEDS key competencies which are at the core of the framework; while different delivery methods and global health values and principles to be taught are surrounding the CanMEDS-oriented lens (*Figure 2-2*). The following eleven core values and principles for global health in family medicine were identified by the Ontario Global Health Family Medicine Curriculum Working Group: social justice, sustainability, reciprocity, respect, honesty and openness, humility, responsiveness and accountability, equity, and solidarity (*Table 2-1*) (51).

The value of this framework is in its unique approach that incorporates global health CanMEDS-oriented core competencies, relevant values and principles, and different

learning approaches. The framework has its application in guiding curricula development, program delivery and evaluation tool development (51).

Figure 2-2 ***Global Health Education in Postgraduate Family Medicine Training framework*** **developed by Ontario Global Health Family Medicine Curriculum Working Group** (*Taken from Redwood-Campbell et al, 2011*) (51)

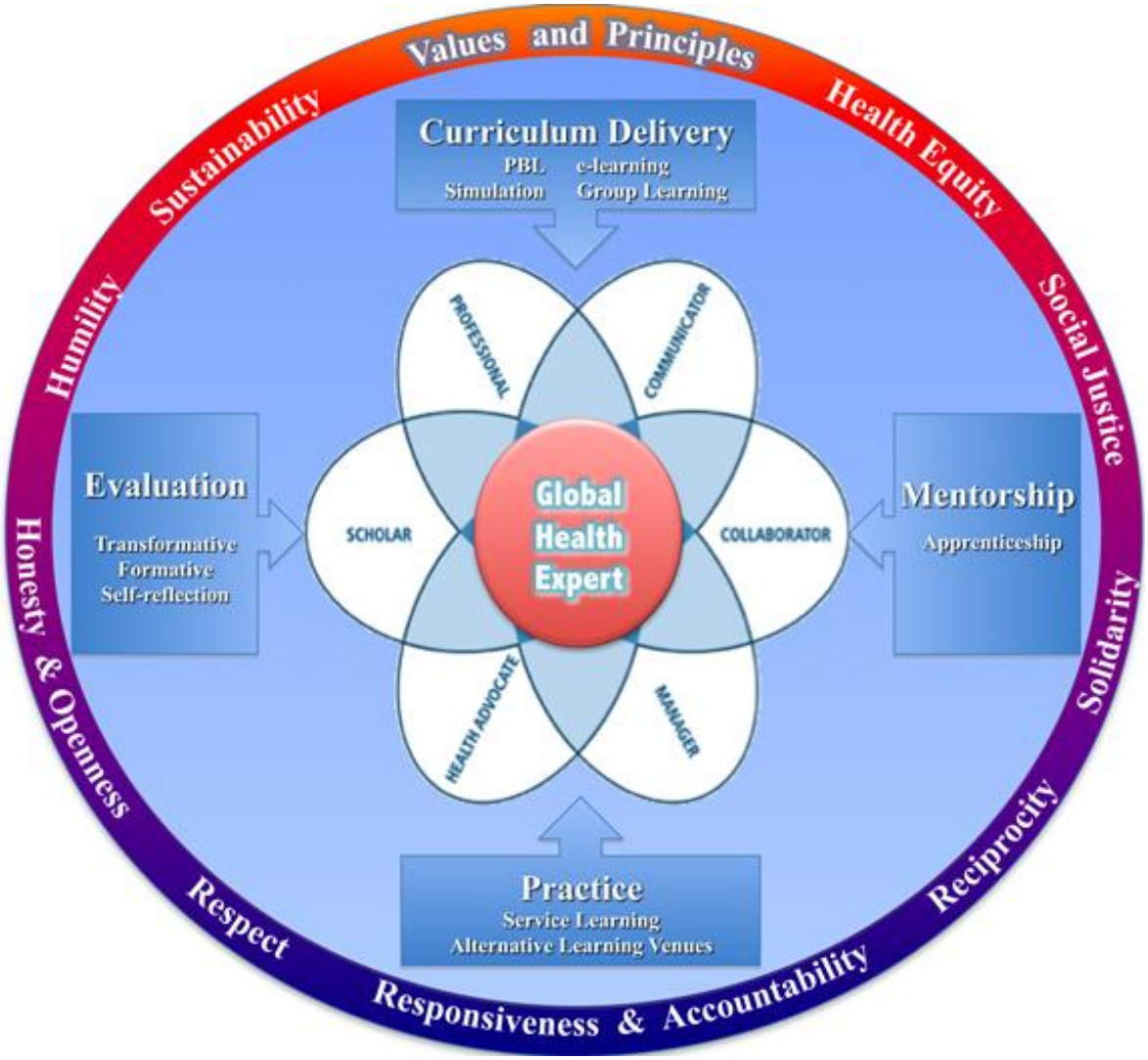


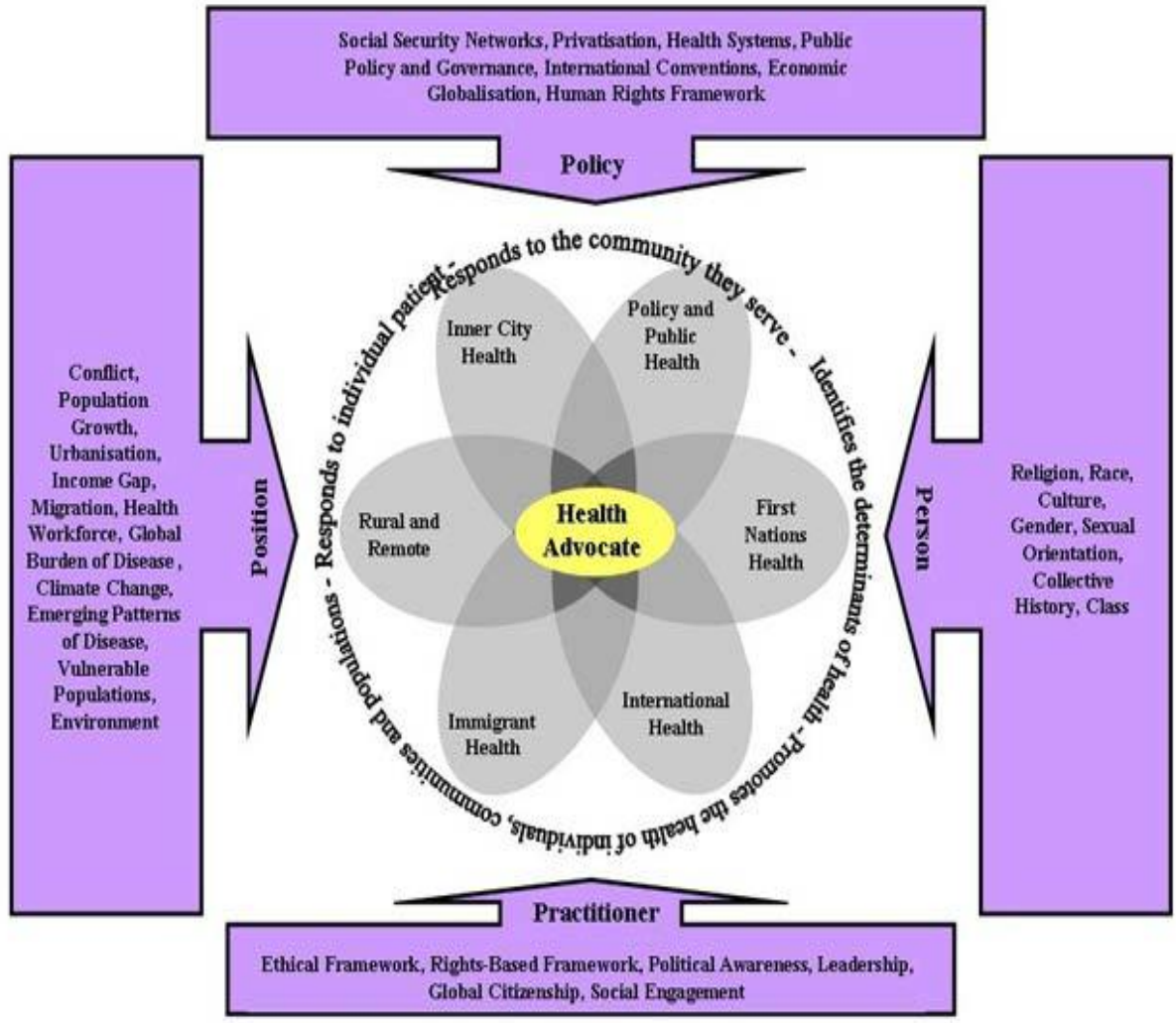
Table 2-1 Values and Principles underlying Global Health and Family Medicine Education (*Taken from Redwood-Campbell et al, 2011*) (51)

- **Social justice** - fair and impartial access to the benefits of society including the right to health
- **Sustainability**- living and working within the limits of available physical, natural and social resources in ways that allow living systems to thrive in perpetuity.
- **Reciprocity** - multidirectional sharing and exchange of experience and knowledge among collaborating partners
- **Respect** - for the history, context, values and cultures of communities with whom we engage
- **Honesty and openness** - in planning and implementation of all collaborations
- **Humility** - in recognizing our own values, biases, limitations and abilities
- **Responsiveness and accountability**- to students and faculty and diverse communities with whom we are involved
- **Equity** - promoting the just distribution of resources and access, especially with respect to marginalized and vulnerable groups
- **Solidarity** – ensuring that objectives are aligned with those of the communities with which we are working

The CanMEDS framework was also used by the Department of Family Medicine at Queen's University to develop a global health curriculum for family medicine (54). The Department applied the CanMEDS role of a health advocate as the central one in their *Curriculum Framework for Global Health: Family Physician as Health Advocate* (*Figure 2-3*) (54) emphasising the importance of this role in global health practice. When describing their framework, a definition of a family physician-health advocate, developed by the College of Family Physicians in Canada is being used; family physicians-health advocates have "responsibly to use their expertise and influence to advance the health and well-being of individual patients, communities, and populations" (55).

Queen's University extends the understanding of the role of a family physician as health advocate to population level, primarily vulnerable populations such as First Nations and immigrants. Their understanding of a physician-health advocate's role is very comprehensive and it accounts for various factors such as social determinants of health at the individual level (e.g. religion, race, culture and gender), environment, global and local economics, resources (e.g. food, health care), as well as public policy and governance (54). Similarly to the *Global Health Education in Postgraduate Family Medicine Training framework* (51), this comprehensive framework developed by Queen`s University demonstrates the complexity of global health and the importance of the CanMEDS framework in the Canadian medical curriculum, and at the same time it may facilitate development of educational programs for medical trainees.

Figure 2-3 Global health framework for family medicine developed by the Department of Family Medicine, Queen's University (54)



2.5. The importance of global health evaluation tools

In order to monitor the effectiveness of medical education, validated program evaluation tools are needed. The *Accreditation Council for Graduate Medical Education* (ACGME), a non-profit organization which grants accreditations to medical residency programs in the United States, recognized the value of evaluating educational outcomes by developing evaluation tools that can be found under the *Outcome Project – Assessing residency education through outcome assessment* (56). The *Outcome Project* focuses on assessing different educational outcomes, such as medical knowledge, skills and attitude and quality of patient care. Medical education programs are required to identify learning objectives that can be met, competency-based objectives are then assessed and the feedback is provided on residents' and programs' performance (56). Different tools developed by ACGME assess a variety of medical residents' competencies and enable the improvement of medical education; however a comprehensive tool for assessing global health education outcomes that could have been used in this study was not developed as a part of the *Outcome Project* (56).

Specific evaluation tools are needed to ensure that medical students are getting appropriate and effective global health education to enable them to practice competently and confidently in culturally diverse environments and with disadvantaged groups. These tools should be based on global health competencies that learners should develop in order to improve outcomes of marginalized and disadvantaged patients. Several relevant evaluation tools have been identified; nevertheless they did not fully cover the concept of global health and the CanMEDS objectives. For instance,

the existing tools did not account for CanMEDS framework and they covered only the concept of cultural competence which focuses on delivery of linguistically and culturally relevant services. The concept of cultural competence only partially overlaps with the concept of global health (57-60). Cultural competence focuses on bridging social, cultural and linguistic differences between individuals in order to reduce inequity in access to health care (57). On the other hand, global health is a broader concept. Aside from accounting for social, cultural and linguistic barriers in health care; global health emphasizes health concerns observed worldwide which traverse national borders, race and culture (i.e. poverty) (5). These health issues call for joint action and global cooperation; therefore using the cultural competence evaluation tools to evaluate global health would not be appropriate due to only partial overlap of these two concepts (1,4,5,5).

While both global health education and the CanMEDS framework are embraced by Canadian medical schools, it is challenging to improve the quality and effectiveness of global health programs in Canada without the availability of validated tools that account for these two concepts (61). The *Global Health Education in Postgraduate Family Medicine Training framework* developed by the Ontario Global Health Family Medicine Curriculum Working Group was seen particularly suitable for this study due to its emphasis on global health enhanced role competencies, global health values and principles, and curriculum delivery methods. By building on the *Global Health Education in Postgraduate Family Medicine Training framework* that defines global health CanMEDS-oriented competencies and global health values and principles (51); I developed and validated a self-assessment tool for evaluating the impact of

international clinical experience on global health competencies among medical students and obtained primary data from medical students. The objectives of this study described in thesis were to develop global health self-assessment questionnaire for medical students; to test psychometric properties of the newly developed instrument; to evaluate medical students' self-perceived global health competencies before and after international clinical experience; and to explore the relationship between medical students' characteristics and their self-assessment of global health competencies.

Chapter 3 Study design options

3.1. Introduction

Selecting the appropriate design to evaluate the effectiveness of educational interventions has been an ongoing concern for evaluators (62). Scholars such as Campbell and Stanley, and Howard et al have been providing directions about available evaluation strategies in different contexts and settings; however there is little agreement as the existing evaluation designs each have their pros and cons (62-82).

Since one of the objectives of this study was to learn about medical students' self-perceived global health competencies before and after the international clinical experience, the following evaluation designs were considered - traditional pretest/posttest design, retrospective pretest/posttest design, and Solomon four-group design, a design that incorporates both traditional and retrospective pretest/posttest designs. Traditional pretest/posttest design involves administration of pretest before the intervention; whereas in retrospective pretest/posttest design pretest is administered after the intervention. Each of these designs will be described below.

3.2. Traditional pretest/posttest

Traditional pretest/posttest design (also called Conventional pretest/posttest and Pre–Then-Post design) involves administering a survey at two points in time – before and after the intervention (67,83). This method is viewed as rigorous and credible by

some authorities when measuring objective outcomes (67,83). This design also reduces certain sources of bias (e.g. recall bias) that are encountered in retrospective pretest/posttest design; however it does not eliminate response-shift bias (*Figure 3-1*) (71,83).

The response-shift bias is a phenomenon that occurs due to a significant shift in respondents internal understanding of the concepts examined (64,66,76). New knowledge gained through the intervention may reconceptualise, reprioritize, and recalibrate respondents' internal perception of constructs; therefore potentially causing inaccuracy in measures obtained at pretest. Reconceptualization refers to change in the understanding of constructs evaluated (84-86). If study participants do not have a good understanding of objectives and concepts that are being evaluated, they may evaluate their self-perceived competencies in certain area prior to the intervention higher than they actually are (64,66,76).

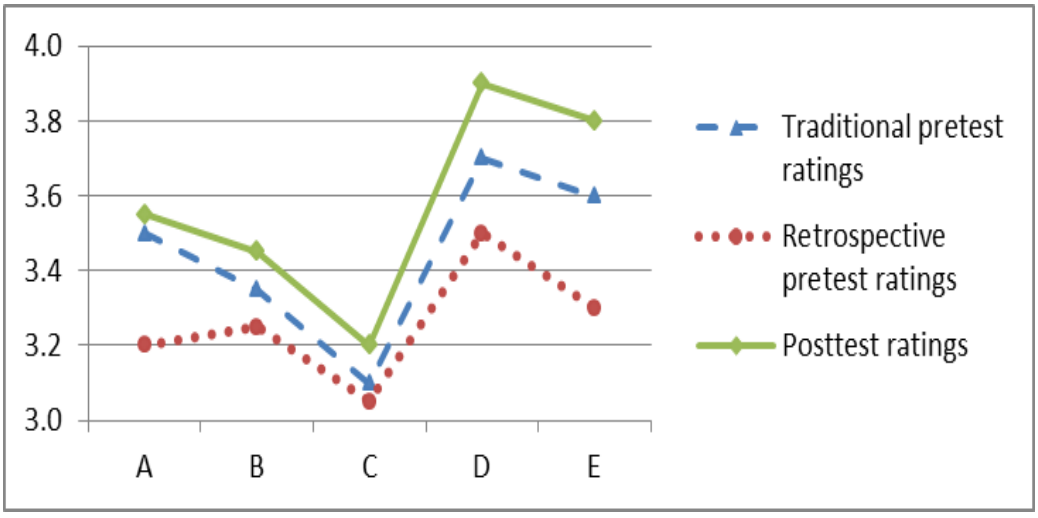
Reprioritization is one's change of perceived relative importance of certain aspects of concepts assessed (84-86). McPhail and Haines provide an example about health-related quality of life in patients with lower back pain. For some individuals, being able to play with children becomes a higher priority in their assessment of well-being after they started having back pain (87).

Recalibration, on the other hand, refers to change in individuals' scale of values – some concepts can be valued higher or lower on their scale after certain experience (84-86). For example, a patient with lower back pain may value his health as 9/10 compared to his wives (10/10); however if he watches a game of sports his scale of

values may change. Now he may use a sport player as a frame of reference, and he may value his health as 6/10 (87).

Consequently, these changes in participants understanding of concepts, changes in priorities or changes of inner frames of reference may result in underestimated effect of the intervention when traditional pretest/posttest design is used (*Figure 3-1*) (70,72,88). This is supported by several studies. During interviews with study participants, Sibthorp et al found that they justified differences between their traditional and retrospective pretest scores by lack of understanding of the items (88). Moreover, participants were not able to recall the pretest scores that they provided prior to the intervention and it appeared that they provided more informed responses post-intervention (88).

Figure 3-1 Illustration of potential underestimation of the intervention effect in traditional pretest/posttest design due to response-shift bias



One way to account for the response-shift bias is to introduce a control group that will not receive an educational intervention (83). The control group would complete a pretest before the intervention and a posttest at the same time as the group that will receive the intervention. Measure of change would be obtained for each group, and these measures of change for intervention group and control group would be compared (83). Any differences found in the intervention group and not in the control group are then attributed to the intervention and the change in internal standard that participants' applied in their assessment (83).

Furthermore, Campbell and Stanely described several threats to internal validity present in traditional pretest/postest design, one of them being history. Historical events that occur outside the experiment and between two test administrations (between pretest and posttest) can impact participants responses (63). Moreover, maturation is a frequent concern in educational research. It may affect participants' performance because participants may be more mature at posttest than at pretest as a function of time (63). In addition, instrumentation, the use of different evaluation instruments at pretest and posttest, may be another potential threat to internal validity in traditional pretest/posttest design (63).

Aiken and West indicated four sources of pretest self-report bias; respondents limited experience (unfamiliarity with the concepts of the program) being one of them (89). This negative response-shift bias is consistent with research findings from other scholars (64,66,76). Second source of pretest self-report bias described by Aiken and West is condition justification – unconsciously respondents exaggerate negative events in their life to justify their condition (e.g. depression), this way treatment effects will be

overestimated (89). Furthermore, altered states such as substance abuse may provide inaccurate ratings (e.g. alcohol will underestimate the effect because respondents will evaluate themselves more positively under the influence of alcohol) (89). Finally, respondents may consciously distort their answers to access desired intervention (e.g. treatment, organizational or educational training) so their answers will match the acceptance criteria of the program (89).

Pretest may also have an experimental effect and sensitize the study participants (67). In their meta-analysis of 32 studies, Wilson and Putnam found that participants who took part in pretest session prior to the intervention performed better at posttest than those who did not complete a pretest, suggesting that pretest can sensitize participants (90). Retrospective reporting is suggested as an alternative solution to reduce the pretest effect (91).

Another drawback of the traditional pretest/posttest is that it requires administration of the evaluation twice, which may be burdensome for participants and evaluators (62,82). Educators and evaluators need to allocate additional time for the evaluation which may not always be feasible (62,82,92). Traditional pretest/posttest is also more costly, and the complete pretest and posttest data is harder to obtain because participants have to be present during both times (62,71).

3.3. Retrospective pretest/posttest

An alternative design considered in this study was retrospective pretest/posttest, also named Post-Then-Pre design (83). This design involves evaluation after the intervention at a single point in time. Participants are then asked how they perceive themselves both before and after the intervention. This design is used in many settings with different populations. For instance, the design is used for program evaluations (e.g. professional development programs), in educational setting (e.g. medical education), and in quality of life research (63,64,76,93).

Retrospective pretest/posttest design has certain advantages. Compared to traditional pretest/posttest, retrospective pretest/posttest is easier to administer and relatively inexpensive. It is also a very convenient and a fast way to evaluate educational interventions (93). In addition, it allows a more complete dataset than traditional pretest/posttest because both pre and post measures are collected at the same time (71,94). With its single administration, retrospective pretest/posttest design also ensures that study participants use the same internal standard when they provide responses about tested concepts, thus this design reduces response-shift bias which is commonly observed in traditional pretest/posttest (64,65).

Moore and Tannanis attempted to explain response-shift bias by examining the pattern of retrospective pretest, traditional pretest scores and posttest scores while evaluating an international affairs summer program. Retrospective pretest scores were significantly lower than traditional pretest scores suggesting that participants overestimated their initial ratings, which was consistent with previous research (80).

During focus groups and by providing comments to open-ended questions in the questionnaire, study participants explained that they overestimated their initial knowledge when completing traditional pretest because they were not aware of all the skills and knowledge that was taught (80).

Similar findings were reported by Cantrell; preservice teachers reported greater improvement in science teaching efficacy after the program when retrospective pretest/posttest evaluation was used compared to traditional pretest/posttest evaluation (77). During interviews, study participants stated that at traditional pretest they lacked understanding of the program and constructs and as the program progressed their attitudes and believes changed which led to different retrospective pretest ratings (77). Moreover, Hoogstraten found that retrospective pretest/posttest ratings better reflect the actual change in participants' performance than traditional pretest/posttest scores (81).

Studies comparing more objective measures and self-assessed measures using retrospective pretest/posttest design and traditional pretest/posttest design showed that change in more objective parameters was better correlated with responses when retrospective pretest/posttest design was used, than with responses obtained when traditional pretest/posttest design was used (64,65). Also, retrospective pretest/posttest design showed to be more sensitive to change in study by Hoogstraten (81). Retrospective design indicated improvement after the intervention which was correlated with the objective measures of improvement; whereas traditional pretest/posttest design suggested that there was no change after the intervention (81).

Yet, retrospective pretest/posttest design has its drawbacks. The controversial component of this design is its retrospective pretest component, also known as *then-test* (63,72). In the retrospective design participants are asked to evaluate their knowledge, attitudes, behaviour or self-perceived skills prior to the intervention in retrospect - after they have completed it (63,83). Retrospective evaluations are associated with several sources of bias (72,73,83). Hill and Betz identified the following concerns related to retrospective pretest designs - recall bias, social desirability bias, effort justification bias, and cognitive dissonance bias (*Table 3-1*) (72).

Recall bias (e.g. a distortion of memory) is observed to some extent in all retrospective assessments and it is more prominent with the increased length of recall time (65,83,95). Study participants respond to questions with an estimate of the past behaviour that may not correspond to the accurate judgement (65,83,95). Research showed that details required and time elapsed since the intervention are inversely associated with recall bias. This was observed in studies on dietary habits, medication usage, work history and obstetric history (96-99).

Recall bias occurs whenever respondents need to provide information about prior experiences (100). This bias may occur not only due to memory failure, but it is more likely to happen when a known exposure leads to the relevant outcome (100,101). Individuals with certain relevant exposure may be more prone to overreport associated outcomes; whereas those without exposure may be more likely to underreport the same outcomes (100). Raphael suggests asking study participants whether they are aware of factors that are associated with the outcome. If the individual does not report exposure

that he recognizes as a factor related with the outcome (e.g. a disease) then there is fairly good evidence that recall bias did not occur (100).

Study participants may also feel that they need to report an improvement after an educational intervention as this improvement will be seen favourably by others or they may not report undesirable behaviour (i.e. social desirability bias) (65,83,95). Hill and Betz noted that respondents evaluated socially desirable items with lower retrospective pretest ratings (relative to traditional pretest ratings); therefore the observed positive change was greater for socially desirable items (65,83,95). Similar pattern and a greater change in scores were also observed for items that assessed behaviours were covered by the intervention (65,83,95).

Effort justification bias is another potential reason for observing a positive change after the intervention when evaluating outcomes with retrospective pretest/posttest design (72,73). Participants may experience a disagreement between the effort they invested (e.g. money, time) and the effects of the program on their skills, behaviour, or attitudes. Festinger described this phenomenon called a cognitive dissonance in his book *A Theory of Cognitive Dissonance* (102). To justify the effort, participants are more inclined to report positive change after the program, although no change took place. Also, if the experience (e.g. the training) was unpleasant, the effort justification bias will be more prominent (103).

Table 3-1 Strengths and Weakness of traditional and retrospective pretest/posttest designs (contents of the table obtained from Colosi and Dunifon, 2003) (72,73,83)

	Traditional pretest/posttest design	**Retrospective pretest/posttest (Post then Pre design)**
Source of bias	Response shift	Recall Social Desirability Effort Justification Cognitive dissonance
Concerns about method	Could underestimate program effect.	Tends to overestimate program effect.
	Time constraints educator faces.	Measures pre and post at the same time, sometimes using same instruments, leads to biases listed above.
	Burden on participants to fill out same form twice.	Does not allow for any attrition data or process evaluation data.
	Comfort level of participants to be "tested" at program start or sensitivity of information gathered (e.g., child discipline).	Generally not regarded by social scientists as a rigorous or credible method to capture outcomes.
Benefits of method	Viewed as rigorous, lends credibility to results.	Easy to administer.
	Measures same person at two intervals in time, reduces many sources of bias listed under "post then pre."	Reduces response shift bias.
	Objective measure of outcomes, not perceived change of participants.	Allows for participant reflection about program effect on particular topic.
Best to determine /Goal of evaluation includes	Quantifiable changes in outcomes, especially behavioral items.	Participant's perceived change due to program attendance.

Lastly, in retrospective pretest/posttest design respondents may report improvement after the intervention although no improvement has occurred because of implicit theories of change - respondents expect a desired change due to their participation in the intervention (72,73,104). Norman explains that patients are often asked to recall their earlier state and to compare it to their current state (104). This may be challenging to someone with a chronic disease; still, patients provide answers that may be based on an implicit theory of change (104).

Ross demonstrated that thinking about change starts with the evaluation of the present state, which is then compared with the recalled past state (105). Implicitly one thinks that change has occurred (deterioration or improvement) (105). Conway and Ross conducted a study in which they asked university students, participants of an ineffective skills intervention, to recall their reported skills prior to the intervention (106).Those who received the intervention systematically reported greater change in skills compared to those who did not participate. They also anticipated better grades; although the actual grades did not differ between groups (106).This may have occurred due to an implicit theory of change which they expected because of their engagement in the skills improvement program (106).

3.4. Threats to validity in traditional and retrospective prestet/posttest designs

Self-reporting is a threat to validity in both traditional and retrospective pretest/posttest design (107). Accuracy of the provided responses may be affected because self-evaluation may not provide an accurate measure of skills, attitudes or knowledge (93). Acquiescence, participants' inclination to answer questions affirmatively, is an additional limitation of self-reported measures that may impact the results (108). Likewise, satisficing, responding to questions with a satisfactory but not an optimal answer, may occur when self-reported outcomes are measured (109). Respondent may not take the time to think through every question and instead provide a convenient answer (109). For example, the respondent may select a first reasonable response; agree with every true or false statement; she or he may provide a neutral answer to all the questions; or select the same answer for all the questions (e.g. by drawing a straight line) (109). Furthermore, if asked for an opinion, a respondent may just agree with the current state of the matter (e.g. current regulation related to in-vitro fertilization), or just provide responses at random without thinking through or reading the question (109).

Social desirability is a concern in traditional and retrospective pretest/posttest designs because respondents may provide the answers that they may think the evaluators expect and that are socially appropriate and seen favourable (93,110,110). Contrary to social desirability, *faking bad* may also occur as a source of bias either on purpose or unintentionally (89,110,110). Cultural context (respondents and literacy, language skills and cultural background) should also be accounted for when evaluating

program effectiveness, because questions may be challenging to understand for some respondents (93).

Choice between traditional pretest/posttest design and retrospective pretest/posttest design largely depends on the research question (83). If the evaluation aims to capture change in an objective measure, traditional pretest/posttest is recommended as a better and more accurate choice by Hill and Betz (72,83). Alternatively, retrospective pretest/posttest is perceived as a more adequate design to determine subjective self-perceived change as a result of an intervention (72). However, using traditional pretest/posttest design instead of retrospective pretest/posttest design or vice versa, simply means that one set of biases is replaced with another set of biases (83). Despite its limitations, retrospective pretest/posttest design is commonly used in evaluations (80).

3.5. Application of traditional and retrospective pretest/posttest designs

Some researchers have been promoting substitution of traditional pretest with retrospective pretest which they see as a very useful tool for measuring program outcomes (75). In their paper, Pelfrey and Pelfrey describe their use of both traditional and retrospective pretest/posttest in an evaluation tool to capture the change in knowledge after educational programs at Naval Postgraduate School (75). They suggested that response-shift bias will be lower when retrospective pretest/posttest design is used than when the traditional pretest/posttest design is used, because respondents are completing the questionnaire at one point in time and they will use the

same frame of reference to complete the assessment (75). Furthermore, respondents in this study had interdisciplinary background so heterogeneity in their understanding of the program would undermine the reliability of traditional pretest/posttest (75).

Initially, both traditional and retrospective pretest/posttests were used for program evaluation at the Naval Postgraduate School and their findings were inconsistent; traditional pre/post design was showing very little change between pre and post assessments (75). When investigating the reasons for inconsistency between the two approaches, students reported that prior to participating in the program they misinterpreted the concepts and that they did not have sufficient understanding of learning objectives that were covered during courses (75). Pelfrey and Pelfrey concluded that retrospective pretest/posttest was a more reliable and valid tool that can be used to evaluate knowledge obtained through the courses (75).

Similar findings were noted in a study by Skeff et al in which traditional pretest/posttest design and retrospective pretest/posttest designs were used to evaluate medical faculty development program (69). Aside from requesting from faculty members to self-assess their teaching abilities; faculty members' teaching abilities were also evaluated by students and house staff that were attending teaching sessions.

The study found that retrospective pretest/posttest ratings detected positive difference for all the outcomes measured (69). Conversely, traditional pretest/posttest comparisons were significant only for some outcomes and they showed either no change or decrease in participants' teaching performance (69). Pretest/posttest changes obtained from students and housestaff data were more consistent with self-

reported findings from retrospective pretest/posttest than traditional pretest/posttest (69). Compared to the traditional pretest, retrospective pretest scores were consistently lower. This resulted in greater and significant differences when retrospective pretest/posttest data were collected, suggesting that retrospective pretest/posttest scores are more sensitive to change than traditional scores (69). Furthermore, Skeff et al did not explain the differences between retrospective and traditional design by the time passed between evaluations as this was controlled for; but rather with improved understanding of the concepts (69). The authors concluded that retrospective pretest/posttest ratings may present a more valid and more sensitive measure of the faculty development program effectiveness (69).

In their study, Taylor et al evaluated a single leadership training program aiming at improvement of interpersonal skills using traditional pretest and retrospective pretest/posttest evaluations (73). The intervention was administered only to the group of supervisors; however pretest and posttest data were collected from both supervisors and their subordinates who did not receive the intervention. The purpose of their study was to evaluate inflationary bias observed when retrospective pretest is used (73).

Results showed that retrospective pretest scores were lower than traditional pretest scores in both groups; the one that received the intervention and in the control group (73). Taylor et al provided several explanations for this observation. Retrospective pretest scores may have been lower and the difference between pretest and posttest greater due to participants' application of implicit theory of change. Secondly, the participants may have justified the effort invested into participation. Lastly,

self-enhancement bias may have occurred. This resulted in greater change in scores when retrospective pretest measures were used (73).

Lower retrospective pretest scores were expected in the group of supervisors who received the intervention. Yet, the group that did not receive the intervention also exhibited inflationary bias at baseline when completing retrospective pretest. When providing responses about past behaviour which they do not recall well, study participants may apply the estimate strategies – namely self-enhancement bias and implicit theory of change (73). Taylor et al recommended that in the future research control for inflationary bias should be considered. For instance, retrospective pretest and posttest could be administered at different times which may prevent respondents from providing lower retrospective pretest scores. Additionally, items not included in the intervention can be incorporated in pretest and posttest evaluations as control items. They can be then used to evaluate respondents' baseline tendency to report improvement (73).

3.6. Solomon four-group design

Given that the traditional pretest/posttest design and retrospective pretest/posttest design have their limitations, Solomon four-group design was another potential design considered for this study. Solomon four- group design is a complex study design first proposed by Richard Solomon in 1949 as an extension of control group design (111). This design incorporates both traditional pretest/posttest design and the retrospective pretest/posttest and allows for a comparison of two methods. The

Solomon four-group study design has two parallel intervention groups and two control groups (63,67). This design requires more study participants, it is more time consuming and more costly, however, it provides more answers about the evaluation instrument (63,67).

Moreover, two experimental groups and two control groups need to be included in this design. Taking my study as an example, if this design was selected, the following four groups would be created. The intervention group 1 would be asked to complete the evaluation before and after the intervention (traditional pretest/posttest design). Control for this group would complete the same evaluation at the same time; however it would not receive the intervention (*Figure 3-2*). On the other hand, the intervention group 2 would complete both pre and post components of the evaluation after the intervention, and so would the control group 2 that would not receive the intervention (retrospective pretest/posttest design) (*Figure 3-2*). Before completing pretest evaluation, the control group 2 would be instructed to assess their competencies during a specific time frame that would coincide with the time of pretest for intervention group 2 (e.g. September of certain year). This way it would be possible to control for any external factors that may have influenced the results such as maturation of the participants or any events that may have taken place and impacted the responses (111).

Figure 3-2 Solomon four-group study design

		Time		
		Pre	**Intervention**	**Post**
Intervention group 1	R	O_1	X	O_2
Control group 1	R	O_3		O_4
Intervention group 2	R		X	O_5
Control group 2	R			O_6

R= Random allocation *O = Observation* *X = Intervention*

Solomon four-group design allows researchers to compare the experimental groups to control groups, but also to compare two experimental groups (112). Comparing data collected with Solomon four-group design, may provide answers about response-shift bias and pretest sensitization (63,67). Solomon four-group design is beneficial when response may be affected by pre-intervention measurement (pretest) because information is collected from two intervention and two control groups and this data can be compared (113). Yet, Solomon four-group design is also more expensive than classical randomized controlled trial (113). In addition, due to larger number of study groups, statistical analysis method is more complex and no general agreement about approaches to the analysis is reached (113,114).

Solomon four-group design is one of the most rigorous experimental designs, because it provides control groups for both experimental conditions as it controls for external validity factors (63). It is used commonly in educational setting. For example, Cook et al used Solomon four-group design to evaluate medical residency program for future physicians; specifically to compare case-based self-assessments questions in web-based teaching to non-case-based self-assessment questions (115). Sprangers

and Hoogstraten used Solomon design to study pretesting effects in retrospective pretest for evaluation of communication skills training (67). Furthermore, Dukes et al used this design to test the impact of pretesting and maturation on constructs related to drug abuse resistance education (116). In their study, Bakotic et al used this design in evaluating effectiveness of educational leaflet in high school students. Weinrich et al explored the difference between two different educational methods and the impact of pretest evaluation on posttest knowledge about prostate cancer (117). These examples of Salomon four-group design use provide evidence of its versatility in different settings.

3.7. Discussion

This study aimed to evaluate the change in self-perceived global health competencies among medical students before and after an intervention (international clinical experience). Designs that measure change were considered, however due to limitations related to administration of evaluations and access to the desired population, the choice of appropriate and feasible designs was limited.

Traditional pretest/posttest design was initially considered for evaluation of global health competencies prior and after the international clinical experience. However, the study population in this research study was very hard to reach (medical students with international clinical experience); making the administration of the evaluation at two points in time (before and after the international clinical experience) unfeasible, so alternative design options needed to be explored.

Furthermore, traditional pretest/posttest design is associated with lower completeness of datasets than retrospective pretest/posttest design (71). Both before and after intervention ratings (presence of study participants at two points in time) are needed to register the change, and with hard to reach population that would present a significant challenge. Therefore, the use of traditional pretest/posttest design would reduce the number of complete data points needed to measure the change (71,94). These particular disadvantages of traditional pretest/posttest design related to this specific study, excluded traditional pretest/posttest design and Solomon four-group design as design options.

Retrospective pretest/posttest design was recommended by Hill and Betz in their review as a good design for measuring subjective outcomes after program-related experiences (72,83). Having in mind that, this study aimed to evaluate a subjective change in self-perceived global health competencies among medical students before and after international clinical experience, retrospective pretest/posttest design was seen as a favourable option. Furthermore, since the study population in this study was hard to access, single administration of retrospective pretest/postest was an important advantage of this design that would ensure more complete datasets and satisfactory validity. Although not perfect, retrospective pretest/posttest design was selected as the most appropriate, valid and feasible study design for this study.

Chapter 4 Survey development and implementation

4.1. Introduction

Measuring change in global health competencies among medical students before and after the international clinical experience required a use of a validated evaluation instrument. Since an appropriate instrument was not identified through literature search, a new instrument was developed with a help of expert advisory group. Also, different sampling strategies and data collection strategies were considered in this study.

4.2. Objectives

To design and implement a global health self-assessment questionnaire building on global health core competencies and values and principles outlined in the *Global Health Education in Postgraduate Family Medicine Training framework* (51).

4.3. Methods

4.3.1. Development and Implementation of a Self-Assessment Questionnaire

4.3.1.1. Questionnaire Development

A scoping literature search was performed to identify global health competencies assessment tools that could be used in this study to address its research questions. More specifically, the search aimed to identify evaluation tools designed to assess self-perceived global health competencies in medical students before and after an international clinical experience in order to determine if this experience was associated with a change in global health competencies. The evaluation questionnaires that were identified through a literature search explored certain concepts of interest; however they did not fully cover all global health concepts. The majority of tools examined the concept of cultural competence, which is only one aspect of global health (58-60,118). Since an appropriate evaluation tool was not found, a new questionnaire was developed guided by the *Global Health Education in Postgraduate Family Medicine Training framework* (51).

Initially, the key terms used in the questionnaire were defined. The "*International clinical experience*" was defined as follows: "*a clinical exposure, where a medical student practices medicine in a country other than the one they are studying in. It can be part of their medical curricula, or completed at the student's own initiative. Sometimes it is referred to as an international clinical or professional exchange, elective or rotation*". Regardless of the format in which it was administered to medical students (e.g. organized in a clinical unit versus organized in a community clinic), the

international clinical experience was considered as a uniform educational intervention in this study. The global health skills that were assessed focused on how medical students perceived themselves when working with patients with different linguistic, educational, socioeconomic, and cultural backgrounds.

During the questionnaire development process, an expert advisory group of five members was formed including practising physicians, epidemiologists, education specialists and health measurement experts. The group had expertise in global health, CanMEDS roles, health equity, epidemiology, education and questionnaire development. The expert advisory group was consulted to help identify relevant questions, to comment on wording, content, clarity, visual appearance, ease of completion of the questionnaire, questionnaire format and design. The proposed instrument format was inspired by the *ICCAS – Interprofessional Collaborative Competencies Attainment Survey* one-page format (119,120).

The questionnaire was pretested with a small group of Canadian medical students and international medical graduates who participated in a Summer Institute on Refugee Health at the University of Ottawa in 2010. The participants of the pretest were asked to consider the Summer Institute on Refugee Health as their learning experience on global health and to comment on questionnaire's format and clarity. The changes that this group suggested included rephrasing and clarifying the questions about years of medical education, socioeconomic status, as well as rephrasing and clarifying certain statements in Part C of the questionnaire. They also suggested the introduction of "Not applicable" category as a response option in the Part C of the questionnaire. Their

suggestions were discussed with the expert advisory group until consensus was reached and necessary revisions to the questionnaire were made prior to the implementation (110,121).

The developed questionnaire has four sections. The first introductory section contains basic information about the research project and its purpose. It also explains implied consent and provides details about the ethics approval for the study. Questions in Part A and Part B of the questionnaire include questions that help better describe characteristics of the study population and allow for comparison of different subgroups of study participants. Part A of the questionnaire has eight questions that gather data on participants' age, gender, country of studies, years of training, number of languages spoken, and screening questions about participation in an international clinical experience. The last question in Part A was to be completed only by those study participants who did not have international clinical experience and it provides information about the reasons for not participating in an international experience. Participants who have not taken part in an international clinical experience were informed after completing the last question in Part A that their survey is complete, and participants with international clinical experience were instructed to complete Part B and Part C of the questionnaire.

Part B collects information about the actual international experience. The following information was collected: the number of international experiences, time spent abroad, countries visited, the most important reason for participating in the exchange and information about socioeconomic status.

Assessing socioeconomic status presented a challenge because participants in this study originated from different countries; using monetary value of income or employment status would not necessarily provide comparable results. Also, using years of education was not appropriate because all study participants were medical students with similar level of education so it would not provide information about socioeconomic status. Since study participants came from different countries in which due to cultural differences youth becomes financially independent at different age; obtaining information about parents' socioeconomic status would not necessarily reflect socioeconomic status of medical students or provide comparable results. An indirect measure of assessing socioeconomic status was developed. Study participants were asked to evaluate their socioeconomic status in comparison with other people during their upbringing.

The question about socioeconomic status:

When I was growing up, the socioeconomic status of my family in comparison to other people was:

□ *Better than most people*

□ *The same as most people*

□ *Worse than most people*

Part C of the questionnaire contained questions for a self-assessment of global health skills when working with patients with different linguistic, educational, socioeconomic, and cultural backgrounds before and after the international clinical

experience. The questionnaire items in this section followed CanMEDS-oriented global health core competencies - physician as a communicator, a collaborator, a medical professional, a health advocate, a manager and a scholar (51). A five-point Likert scale was used to specify levels of agreement when obtaining responses on specific global health competencies (122,123). Pretest participants, medical students and international medical graduates, commented that they did not have relevant training or experience to respond to all the questions in part C. After a discussion with the expert advisory group "Not applicable" category was added to the Likert scale as one of the response options. Retrospective pretest/posttest design was used in Part C of the questionnaire – participants are asked at the same time about their self-perceived global health competencies both before and after the international clinical experience. The complete questionnaire can be found in the *Appendix B*.

4.3.1.2. Sampling strategy

The purpose of this study was to validate the self-assessment instrument that was developed and to determine whether international clinical experience impacts self-perceived global health competencies among medical students. Since international clinical experience is not a mandatory component of the medical curriculum in Canada and centralized databases with the larger number of potentially eligible study participants were not identified, selecting a random sample was not feasible. In order to obtain a sufficient number of hard to reach study participants with international clinical

experience, other ways of sampling were considered, one of them being convenience sampling, a form of non-probability sampling.

Despite important disadvantages of non-probability sampling (i.e. study participants being chosen arbitrarily and not randomly, inability to estimate probabilities, and increased risk of bias), in this study convenience sampling method was used for questionnaire testing and during the survey development (124). Non-probability sampling is also considered appropriate in pilot studies and surveys of specific groups that are hard-to-identify, which is the case in this study (125).

Convenience sampling is particularly useful in studying populations and it is commonly used for research among students. Cunningham et al reported that student population was used in 20 to 33% of consumer behaviour research, out of which 75% were convenience samples (126). In another study, Brenner et al recruited over 4000 high school students to obtain their self-reported height and weight information (127). Blanchard et al used convenience sampling strategy to recruit university students for their study on physical activity that involved questionnaire administration (128).

Furthermore, convenience sampling is used in population research. Kelly et al studied age-specific immunity to vaccine preventable diseases using convenience sample and random cluster survey (129). Comparison of two sampling methods found no significance difference for majority of immunity estimates (129). Authors concluded that convenience sampling is an appropriate approach to obtain population immunity data (129).

Still, convenience sampling has substantial disadvantages, such as selection bias, lack of representativeness among study participants and inability to generalize study results (130,131). Selection bias, a tendency to include specific type of study participants, is a major concern in convenience sampling (130). Probability sampling minimizes selection bias and allows for generalizability of results. Freedman notes that convenience samples are commonly analyzed and reported as simple random samples; however that means that a lot of assumptions are being made that are not necessarily accurate (130).

Although a preferred method, random sampling was not possible in this study, therefore despite its drawbacks, convenience sampling was selected. Due to that, study results should be interpreted with caution and they cannot be generalized.

In order to recruit a convenience sample of medical students with international clinical experience, International Federation of Medical Students' Association (IFMSA) was contacted. This medical student organization is represented in 98 countries with over 1.2 million medical student members and it expressed an interest in participating in this study. One of the organization's missions is to promote cultural understanding and co-operation among medical students and all health professionals by facilitating international student exchanges (132). IFMSA facilitates close to 11,000 international exchanges for medical students each year.

Canadian medical student organization CFMS is a member of IFMSA and in 2010 the association reported that 60 medical students from Canada participated in international exchanges facilitated by IFMSA showing that Canadian medical students

are interested in international learning experiences (133). One of CFMS programs focuses on global health activities and it helps facilitate international exchanges for Canadian medical students.

Due to an important contribution to facilitation of international clinical experiences and Canadian representation, IFMSA was seen as a good opportunity to identify study participants with international clinical experience. Initially the administration of the questionnaire in the format of an online survey was discussed with IFMSA. Randomly selected study participants (IFMSA members) would be prompted to complete the questionnaire when providing feedback about their international clinical experience.

Random sampling of IFMSA members with and without international clinical experience through and online database was initially considered as a preferred sampling method. However, this showed to be unfeasible, because at the time of the survey an up-to-date electronic registration database with the contact list of IFMSA members with international clinical experience did not exist. Additional opportunities to administer the survey were explored.

After learning that close to 1000 IFMSA members meet every year at a General Assembly, this meeting was perceived as a good opportunity to access the population of interest and to obtain satisfactory number of study participants. In 2010 the IFMSA General Assembly was held in Montreal and it presented a feasible and affordable option for the study. Selecting a convenience sample and administering a survey during this meeting allowed recruitment of a relatively large number of participants with international clinical experience at a reasonable cost. Also, a substantial proportion of

IFMSA members were expected to have international clinical experience which made them eligible to provide responses about the impact of that experience on their global health competencies (134-136).

The IFMSA Montreal General Assembly participants were selected for a convenience sample in this study. Since the IFMSA General Assembly meeting is an event with many attendees, it was not feasible to identify individuals with and without international clinical experience; therefore one questionnaire was prepared and both participants with and without international clinical experience were invited to participate in the study. In the questionnaire IFMSA members were given clear instructions about the questions and which sections to complete. The official language of the IFMSA meeting was English; thus the questionnaire was administered in English only.

To examine the issue of retrospective reporting bias (verifying whether there will be difference between retrospective pretest and traditional pretest), additional data was collected from Canadian medical students and trainees who attended pre-departure training in English at the University of Ottawa. The majority of University of Ottawa study participants had no international clinical experience and their responses were considered as a comparison group for instrument validation. The University of Ottawa study participants were asked to complete parts A, B and a section of Part C of the questionnaire which contained questions about global health competencies before the international experience. This data collection was conducted in order to evaluate a potential response-shift bias by comparing the answers to Part C section obtained from IFMSA participants with international experience (retrospective pretest data) and

University of Ottawa study participants without international experience (traditional pretest data). Based on the findings from previous research, traditional pretest scores were expected to be higher than retrospective pretest scores (70,72,88).

University of Ottawa respondents may not perfectly match characteristics of IFMSA respondents. Since it was not feasible to collect data related to global health competencies from IFMSA Montreal General Assembly participants without international clinical experience, selecting a group of Canadian medical students appeared to be a reasonable solution. It was also assumed that Canadian study participants have a significant knowledge of the English language to understand and complete the questionnaire which was therefore offered in the English language only.

4.3.1.3. Data collection strategy

4.3.1.3.1. Choice of Data Collection Mode

Several modes of data collection were considered for the present study. Using some modes of data collection was challenging due to the nature of this study and because the population of interest (international medical students with international clinical experience) was hard to reach. For example, since the sampling frame for international study participants that have international clinical experience was hard to identify, administering a survey face-to-face, over the phone, or via mail was not feasible due to the high cost and inability to reach all participants who would potentially be eligible and selected for the study.

An internet-based survey was also considered. However, sampling and reaching eligible medical students via the internet was not possible, because at the time of the survey IFMSA did not have an up-to-date database of student members who attend international clinical electives. In addition, the administration of an online survey internationally may have breached certain laws in some countries and additional ethical approvals may needed to be sought. Furthermore, the response rates in online surveys tend to be relatively low (121,125).

Administering a self-administered paper-based questionnaire during meetings and educational sessions was expected to yield high response rates and high completion rates compared to other modes of data collection (121,137). Taking into consideration the population in this study and the various strengths and weaknesses of existing data collection modes, a paper-based self-administered questionnaire was the most suitable mode for data collection.

4.3.1.3.2. Survey implementation

The survey was administered during the IFMSA General Assembly meeting to Canadian and non-Canadian study participants. Additionally, the survey was administered to Canadian study participants prior to pre-departure training at the University of Ottawa. Questionnaires were administered to study participants by persons chairing the meeting or by the researcher. The purpose of the questionnaire was explained to the study participants, and they were informed that their participation is voluntary, and that the collected information was anonymous and confidential. By

choosing to complete the questionnaire, participants were considered to have consented to participate in the study. Furthermore, each questionnaire was marked with a unique number, so all distributed and completed questionnaires could be easily identified and the response rate calculated. The questionnaire also contained clear instructions on how it should be completed.

4.3.1.3.3. Incentive

No incentives were given to study participants. However, IFMSA and the Office of Global Health at the University of Ottawa were provided with the study results that could be used to improve the international clinical experience.

4.3.1.3.4. Ethical considerations

Ethical approval for the survey was obtained from the Ottawa Hospital Research Ethics Board (OHREB) prior to the survey administration (*Appendix C*). Participation in this study was voluntarily. Data obtained was anonymous, and it will be kept confidential and stored in a secure place at the University of Ottawa. Researchers did not have access to the list of students registered for the meeting; and the student organization was provided with the study results rather than individual responses.

4.3.2. Sample size

By choosing a non-probability sampling (i.e. convenience sampling) as a method, randomization was excluded. Random sampling assumes that all individuals have equal probability of being selected for the study and different statistical equations can be used to obtain sample size needed to extrapolate the results. Since the probability for participants to be selected in this study is coincidental and it cannot be quantified, sample size was not calculated. However, if random sampling was possible, sample size would be evaluated separately for each analysis that was performed. Statistical power of the study was calculated for the main research question - a difference between global health competencies scores before and after international clinical experience.

Chapter 5 Study participants' characteristics and their reasons for participating or not participating in international electives

5.1. Introduction

International experience has a positive impact on professional development of future physicians, therefore it is important to identify reasons and barriers to participation in international electives (26). The information about medical students' reasons and barriers to participate in international clinical experience are particularly valuable to stakeholders that facilitate these experiences (e.g. IFMSA) because they may be able to address certain obstacles and encourage more medical students to participate in international clinical experience.

5.2. Objectives

To describe study participants and to identify reasons and barriers for participating in international clinical electives.

5.3. Methods

Surveys were administered to all IFMSA members present during August 1st, 2010 morning sessions of IFMSA General Assembly in Montreal. Study participants were asked to provide information about their age, gender, country of studies, number of languages spoken and completed medical education. Participants without international clinical experience were asked to specify barriers to participation in international clinical experience.

Data were analyzed using IBM SPSS statistical software, version 19. First, descriptive statistics were reported. Next, independent t-tests were performed to compare mean age of the respondents with and without international clinical experience. Bonferroni correction for multiple comparison t-tests was applied (138). Chi square tests were conducted for categorical variables (e.g. gender). Finally, logistic regression was used to examine the association between respondents' characteristics and participation in international clinical experience. All analyses were performed by using listwise exclusion of cases with missing values. If study participants wrote notes on their questionnaire, these were also considered and when possible they were grouped in different themes and reported descriptively.

5.4. Results

5.4.1. Descriptive statistics

In total 505 surveys were distributed, out of which 284 were returned completed by meeting participants. The overall response rate to the survey was 56%. Furthermore, 69% of respondents who did not have international clinical experience and 31% of survey respondents that had international clinical experience completed the questionnaire. Overall, mean age of study participants was 23 years. Fifty-six percent of the study sample was female. Majority of respondents studied medicine in high income countries (61.3%), 23.6% studies in upper middle income countries and a smallest proportion of respondents studied medicine in low income or lower middle income countries (11.3%). The largest proportion of study participants spoke two languages (49.6%), followed by those speaking 3 languages (21.8%) and one language (21.1%). Four or more languages were spoken by 7.4% of the respondents. Furthermore, respondents indicated their level of medical training and years of clinical training completed, and those details can be found in *Table 5-1*.

Group differences between study participants with and without international clinical experience were examined. Independent t-test was performed to compare mean age between the two groups. Significant difference in mean age was observed for study participants with international clinical experience (M=23.4, SD=2.1) and study participants without international clinical experience (M=22.8, SD=2.6; p<.049). The effect size was relatively small (d=0.13).

Chi-square tests were conducted for categorical variables. Significant differences between groups of respondents were observed for number of languages spoken, GNI of country of medical studies (χ^2 (2)=6.20; p<.045), number of completed years of medical studies (χ^2(6)=33.53; p<.001) and number of years of clinical training (χ^2 (3)=33.10; p<.001).

A greater proportion of students with international clinical experience was from high income countries (66%) compared to students without international clinical experience (59%). Also, students with international clinical experience were more likely to speak more than one language compared to students without international clinical experience. Furthermore, IFMSA members with international clinical experience were more commonly in senior years of medical school than IFMSA members without international experience. Students with more years of clinical training more commonly reported to have international clinical experience compared to students with less years of clinical training. These findings are presented in *Table 5-1*.

Table 5-1 Characteristics of study participants members of IFMSA

Questionnaire Part A	All IFMSA study participants N=284	IFMSA participants without international clinical experience N=196 (69%)	IFMSA participants with international clinical experience N=88 (31%)	p-value
Socio-demographic characteristics				
Age* *(mean, SD, range)*	23 (2.5); 19-34	22.8 (2.6); 19-34	23.4 (2.1); 19-30	p=.049 d=.26***
Missing	*2*	*1*	*1*	
Gender**				
Female (percentage)	160 (56.3%)	109 (55.6%)	51 (58.0%)	$\chi^2(1)=.15$; p=.703
Male	121 (42.6%)	85 (43.4%)	36 (40.9%)	
Missing	*3 (1.1%)*	*2 (1.0%)*	*1 (1.1%)*	
GNI group of the country of medical studies **[a,b]				
Low income or lower middle income	32 (11.3%)	28 (14.3%)	4 (4.5)	$\chi^2(2)=6.20$; p=.045
Upper middle income	67 (23.6%)	43 (21.9%)	24 (27.3%)	
High income	174 (61.3%)	116 (59.2%)	58 (65.9%)	
Missing	*11(3.9%)*	*9 (4.6%)*	*2 (2.3%)*	
Number of languages spoken**				
1 language	60 (21.1%)	50 (25.5%)	10 (11.4%)	$\chi^2(3)=15.28$; p=.002
2 languages	141 (49.6%)	101 (51.5%)	40 (45.5%)	
3 languages	62 (21.8%)	35 (17.9%)	27 (30.7%)	
4 or more languages	21 (7.4%)	10 (5.1%)	11 (12.5%)	
Missing	*0*	*0*	*0*	
Medical education**				
1st year	32 (11.3%)	27 (13.8%)	5 (5.7%)	$\chi^2(6)=33.53$; p<.001
2nd year	48 (16.9%)	41 (20.9%)	7 (8.0%)	
3rd year	66 (23.2%)	51 (26.0%)	15 (17.0%)	
4thyear	62 (21.8%)	43 (21.9%)	19 (21.6%)	
5th year	43 (15.1%)	19 (9.7%)	24 (27.3%)	
6th and 7th year	29 (10.2%)	14 (7.1%)	15 (17.0%)	
Other [c]	4 (1.4%) [d]	1 (0.5%) [d]	3 (3.4%) [d]	
Missing	*0*	*0*	*0*	

Questionnaire Part A	All IFMSA study participants N=284	IFMSA participants without international clinical experience N=196 (69%)	IFMSA participants with international clinical experience N=88 (31%)	p-value
Years of clinical rotations completed**				
1 year	78 (27.5%)	50 (25.5%)	28 (31.8%)	$\chi^2(3)=33.10$; p<.001
2 years	52 (18.3%)	38 (19.4%)	14 (15.9%)	
3 years or more	35 (12.3%)	11 (5.6%)	24 (27.3%)	
I didn't start clinical rotations	119 (41.9%)	97 (49.5%)	22 (25.0%)	
Missing	*0*	*0*	*0*	

* Comparison between study participants with and without international clinical experience performed with independent t-test;
** Comparison between study participants with and without international clinical experience performed with Chi square test;
*** Statistically significant at the Bonferroni adjusted alpha level = 0.001 (138);
d = Cohen's d effect size (139,140); p-values of .000 are reported as p<.001
[a] Gross National Income (GNI) Atlas Method (current US$) for the year 2009 - the World Bank data accessed in June 2011(141)
[b] Detailed list of countries of participants' origin with their respective GNI calculated using Atlas Method can be found in the *Appendix D*
[c] Some study participants may already have completed their medical school training and they still participate in the work of IFMSA

Majority of the students with international experience (60%) reported only one international experience and 39% reported two or more international exchanges, electives or rotations. The greatest proportion of students indicated that their international placements lasted from one to two months. Moreover, most IFMSA members with international clinical experience indicated that they experienced clinical practice in only one country (60%), 25% visited two countries, and 12% visited three or more countries. When asked about their socioeconomic status during upbringing when compared to other people, 35% respondents indicated that their status was better than most people, 56% perceived their socioeconomic status the same as most people, and

6% of study participants reported that their socioeconomic status was worse than most people (*Table 5-2*).

Table 5-2 Responses to part B of the questionnaire collected from IFMSA members with international experience

Number of international clinical experiences*	**N**	**%**
One	53	60.2
Two	19	21.6
Three or more exchanges, electives or rotations	15	17.0
Missing	*1*	*1.1*
Total duration of international clinical experience(s)*	**N**	**%**
Less than 1 month	19	21.6
1 month to 2 months	43	48.9
More than 2 months, but less than 3 months	10	11.4
3 months or more	14	15.9
Missing	*2*	*2.3*
Number of countries visited*	**N**	**%**
One country	53	60.2
Two countries	22	25.0
Three or more countries	11	12.4
Missing	*2*	*2.3*
Self-perceived socioeconomic status during upbringing*	**N**	**%**
Better than most people	31	35.2
The same as most people	49	55.7
Worse than most people	5	5.7
Missing	*3*	*3.4*

*Reported by study participants with international clinical experience (N=88)

The majority of IFMSA members with international clinical experience identified the opportunity to experience medical practice in a different cultural environment as the main reason for participating in an international clinical exchange (68.2%) (*Table 5-3*). A desire to travel or to try to arrange residency training after graduation from medical school was reported by 6.8% of participants. The remaining study participants indicated reasons such as search for future employment opportunities, wish to become more independent, improvement of the language skills, fulfillment of medical school curriculum, and building partnership between their medical school and the visiting unit as their motivation to experience clinical practice abroad (*Table 5-3*).

Table 5-3 Reasons for participating in international clinical exchange - data obtained from study participants with international clinical experience

REASONS FOR PARTICIPATING IN INTERNATIONAL CLINICAL EXCHANGE*	Number of respondents	%
To experience medical practice in a different cultural environment	60	68.2
To travel	6	6.8
To try to arrange residency training after I graduate from medical school	6	6.8
To look for future employment opportunities	2	2.3
To become more independent	2	2.3
To improve my language skills	1	1.1
To fulfill the requirements of my medical school curriculum	1	1.1
To try to build a partnership between my medical school and the clinical unit where I was placed as an exchange student	1	1.1
Other	4	4.5
Missing	*5*	*5.7*

*Reported by study participants with international clinical experience (N=88)

The main obstacle to experiencing clinical practice internationally was the lack of opportunities which was identified as a barrier by 25.5% of IFMSA study participants without international clinical experience; whereas 10.7% reported financial reasons to be a barrier. A large proportion of study participants (41.3%) indicated "*Other*" as a barrier to participation in international clinical experience. Their detailed responses were grouped according to the theme and reported separately. The identified themes were lack of time (8.2%), ineligibility for international clinical elective (9.7%) or they indicated their intention to participate in an international elective (11.7%). More than 8% of study participants without international clinical experience indicated that international clinical experience was not their personal/career objective Moreover, a smaller proportion of IFMSA members selected language as a barrier (4.5%); whereas visa/administrative reasons and no opportunities at the medical school were identified by 1.1% of study participants (*Table 5-4*).

Some IFMSA members without international clinical experience (10.8% of them) wrote notes on the questionnaire that stated that they were not eligible for international clinical experience because they were in junior years of their medical education. A proportion noted that they did not have any clinical training which is often a prerequisite for clinical experience abroad. In addition, 13.1% respondents indicated that they planned to participate in an international elective in the future.

Table 5-4 Reasons for not participating in international clinical exchange - data obtained from study participants without international clinical experience

REASONS FOR NOT PARTICPATING IN INTERNATIONAL CLINICAL EXCHANGE*	Number of respondents	%
Lack of opportunities	**50**	**25.5**
Financial reasons	**21**	**10.7**
Was not part of my personal/career objectives	**16**	**8.2**
Language barrier	**8**	**4.1**
Visa/administrative reasons	**2**	**1.0**
Other	**81**	**41.3**
Other- Planning to do an international elective	23	11.7
Other - Not eligible (e.g. no clinical experience)	19	9.7
Other - Lack of time	16	8.2
Other - Not specified	20	10.2
Missing	***20***	***10.2***

*Reported by study participants without international clinical experience (N=196)

5.4.2. Logistic regression results

Logistic regression analysis was conducted on international clinical experience as an outcome and five predictor variables: participants' age, gender, GNI of country of medical studies, years of medical school completed, and languages spoken. GNI per capita of the country of medical studies (Atlas methods, current US$), a parameter obtained from the World Bank database, was selected because it allows for comparisons across economies of countries (141). Initially, the variable *years of clinical rotation completed* was considered to be included in logistic regression model, however correlation analysis indicated a high correlation between this variable and the variable

years of medical school completed (Pearson r = 0.74; *p*=0.01) (*Table 5-5*). The variable *years of medical school completed* was retained in the logistic regression analysis because all study participants were eligible to answer this question; whereas not all study participants had clinical training at the time of the survey.

Table 5-5 Correlation table of international clinical rotation variable and its predictors

	Participant's age	Gender	GNI of country of medical studies	Years completed	Clinical years completed	Languages	International clinical experience
Participant's age	1						
Gender	0.06	1					
GNI of country of medical studies	<0.01	0.16*	1				
Years completed	0.34**	0.01*	-0.16*	1			
Clinical years completed	0.25**	-0.02	-0.12	0.74**	1		
Languages	-0.02	0.01	0.10	0.01	0.02	1	
International clinical experience	0.10	-0.028 *	0.11	0.29**	0.24**	0.20**	1

* *p* <.05; ** *p* <.01;

A total of 264 individuals were included in the logistic regression analysis after deletion of 17 cases with missing values. Hosmer and Lemeshow goodness-of-fit test of the model was statistically reliable χ^2 (8) =5.04, p=0.75 suggesting that predictor variables reliably differentiate between study participants with and without international clinical experience. Cox and Snell R square and Nagelkerke R square values indicated that predictors explained between 16.0% and 22.6% of the variability of the outcome variable. Furthermore, the model correctly categorized 73.9% of the cases (*Table 5-6, Table 5-7*).

Table 5-6 contains regression coefficients, their standard errors, Wald statistics, degrees of freedom, p values, and odds ratios and their 95% confidence intervals for the predictors included in the model. The number of languages spoken, years of medical school completed, and GNI of the country of medical studies were identified as significant predictors of international clinical experience based on the Wald statistics. Each additional language spoken increased participants' odds of participating in international clinical experience by 86%. In addition, a one unit change in years of medical school completed and in GNI of medical country of studies (e.g. change from upper middle income GNI to high income GNI) was associated with an increase in odds by 73% and 79% respectively.

Table 5-6 Logistic regression analysis for likelihood of having international clinical experience

Predictor*	β	s.e. β	Wald's χ^2	*df*	P**	e^{β} (odds ratio)	95% CI for e^{β}
Constant	-5.446	1.832	8.836	1	.003	.004	NA
Participant's age	-.017	.073	.057	1	.811	.983	0.851; 1.134
Gender	-.271	.299	.822	1	.365	.762	0.424; 1.370
GNI of country of medical studies	.581	.238	5.962	1	.015	1.788	1.121; 2.851
Years of medical school completed	.546	.119	21.060	1	<.001	1.726	1.367; 2.179
Languages	.621	.175	12.676	1	<.001	1.862	1.322; 2.621

*Coding scheme of predictors: Gender Female =1, Male =2; GNI of country of medical studies - low income country=1, lower middle income country=2, upper middle income country=3, high income country=4; Years of medical school completed were coded in order e.g. 1st year =1, 2nd year=2 etc.; Languages spoken were coded in order e.g. one language=1, two languages=2 etc.
** p-values of .000 are reported as p<.001
Note: Goodness-of-fit test Hosmer & Lemeshow $\chi^2 = 5.04$; df = 8; $p = 0.75$.
Cox and Snell R2 = 0.160; Nagelkerke R2 = 0.226. NA = Not applicable.

Table 5-7 The observed and predicted frequencies for participation in international clinical experience

Observed	Predicted		Percentage correct
	Yes	No	
Yes	27	54	33.3
No	15	168	91.8
Overall percentage correct			**73.9**

5.5. Discussion

Participation in international clinical experience differs across participants' characteristics. Females were more likely than males to have international experience as were medical students studying in high income countries. Additionally, study participants who spoke more languages or had more years of medical education more frequently engaged in international clinical experience. This can be explained by higher enrolment of females into medical schools and students studying in richer countries being able to afford travel (142). Furthermore, certain international clinical programs require medical students to have already started their clinical training making students from junior years without any clinical training ineligible for such an experience. Also, those individuals who speak more languages may be more open to international learning experiences than those who do not.

This study was conducted among IFMSA members and many of those who indicated to have had international clinical experience may have gained one through this organization. IFMSA offers a limited number of mainly one month international exchanges which can explain why majority of respondents reported participation in one to two month long experience. Since the number of spots for international exchange is limited it is not always possible for students to engage in more than one medical training abroad (60% of study participants indicated that they completed one international clinical experience and visited one country). In terms of socioeconomic status, more than 90% of study participants reported that their socioeconomic status during their

upbringing was either better than most people (35%) or the same as most people (56%) implying that medical students who are in disadvantaged socioeconomic position may not be able to afford to travel abroad. The main motive for international clinical experience was to learn about medical practice in a different cultural environment which is one of the goals of this educational opportunity.

Lack of opportunities was the most commonly reported barrier (25.5%) followed by financial reasons (10.7%). This is an important finding because medical schools and other stakeholders may be able to address these barriers by creating additional opportunities for training abroad and by securing funding for international educational programs for those who cannot afford it. Time was another barrier reported by 8.2% of students. Allocating time for students to participate in international elective or integrating international learning modules in medical curricula may be one of the ways to encourage greater participation. Almost 12% of respondents indicated that they intend to participate in international clinical experience which suggests that there is a great interest for international training. Taking this into account, medical school and other organizations involved in providing health care services internationally should consider this great potential in young educated individuals who are eager to contribute with their knowledge and skills.

Chapter 6 Validation of a self-assessment questionnaire for measuring the impact of international clinical experience on global health competency skills for medical students

6.1. Psychometric properties of the instrument

The validated instrument that could answer the outlined research questions was not identified through literature search; therefore a new instrument was developed. A framework described in Ian McDowell's book *Measuring Health: A Guide to Rating Scales and Questionnaire* was followed when assessing validity and reliability of the questionnaire (*Table 6-1*) (143).

Table 6-1 The framework for assessing validity and reliability (143)

ASSESSING VALIDITY	**Description**	**Completed**
1. Face validity	Does the instrument appear to be assessing the desired concept.	Yes; experts consulted and pre-test performed
2. Content validity	Do questionnaire items adequately cover the themes that were specified in the conceptual definition of its scope; (expert advisory panel; pretesting with a focus group for linguistic clarity).	Yes; panel of experts
3. Criterion validity	Do scores on the instrument agree with a definitive "gold standard" measurement of the same theme.	No; "gold standard" instrument was not identified
4. Construct validity	Includes conceptual definition of the topic (or construct) to be measured, indicating the internal structure of its components and the way it relates to other constructs.	Yes; factor analysis, group differences

4. a Correlational evidence of validity	**Convergent validity (= assessing sensitivity)** = the measurement will correlate positively with other methods that measure the same concept **Divergent validit**y = the measurement will not correlate with others that measure different themes.	No
4. b Factorial validity	**Factor analysis** - describes the underlying conceptual structure of an instrument; it forms the questions into groups or factors that appear to measure common themes, each factor being distinct from the other. **Exploratory factor analysis** - shows how measured variables cluster together to represent underlying construct. **Confirmatory factor analysis** - begins with structural model and tests how far empirical data support the proposed conceptual structure.	Yes; exploratory factor analysis
4. c Group differences and sensitivity to change	An index intended to distinguish categories of respondents (e.g. healthy and sick, anxious and depressed) may be tested by applying it to samples of each group and by analyzing the scores for significant differences. Significant differences in scores disprove the null hypothesis that the method fails to differentiate between them.	Yes; group differences based on hypothesis were explored

ASSESSING RELIABILITY OR CONSISTENCY	The consistency or stability of measurement process across time, patients or observers (i.e. repeating measurements should give matching results). **Inter-rater agreement or retest reliability** using Pearson correlation (not commonly used) **Interclass correlation (ICC)** = measures the average similarity of the subjects' actuals cores on the two ratings, not merely the similarity of their relative standings on the two (commonly used). **Standard deviation of measurement** = the standard deviation of an individualized score and is pertinent to individual-level applications.	No
Internal consistency	**Cronbach's alpha** = the average of all of the split-half correlations that could be calculated for an instrument and is used where the items have more than two response options **Other formulas for internal consistency:** Kuder-Richardson Formula 20; Guttman's scalogram; Coefficient theta; Coefficient omega	Yes; (Cronbach's alpha was calculated after factor analysis when appropriate)

6.2. Assessing validity

6.2.1. Face validity

Face validity of the newly developed questionnaire was assessed by the expert advisory group. The expert advisory group consisted of five members with backgrounds in medicine, epidemiology, education, and health measurement. The experts were also knowledgeable about global health and CanMEDS competencies for physicians, the key concepts covered in the questionnaire. The instrument questions related to CanMEDS global health competencies appeared to measure competencies of interest.

6.2.2. Content validity

The instrument was intended to measure global health competencies among medical trainees aligned with CanMEDS roles (51). Its content was evaluated by the expert advisory group to ensure that the items represented desired concepts. The advisory group's expertise in global health and CanMEDS roles was crucial for the content validity assessment. Moreover, the expert advisory group members had experience in medical curriculum development and teaching global health to medical students. This helped in determining whether the questions address competencies medical trainees should develop to practice medicine effectively in order to meet their patients' needs.

Specifically, questions focused on work with disadvantaged populations; patients with different linguistic, educational, socioeconomic, and cultural backgrounds. These

global health concepts were adequately addressed by items included in the questionnaire. Additional questions were considered for the instrument to better address global health competencies. Yet, since the questionnaire was administered to IFMSA study participants during a large meeting and incorporated into a busy meeting agenda this was not done as it may have translated into a lower response rate (121). In order to improve the response rate, the number of scale items was limited and they were formatted so they fit on one page. Moreover, scale items were organized in an appealing easy-to-follow format (121).

6.2.3. Construct validity

Construct validity of the questionnaire in assessing the following global health competencies – physician as a communicator, collaborator, medical professional, health advocate, manager, and scholar was examined by conducting an exploratory factor analysis and by comparing two groups of study participants to identify potential significant differences in scores.

6.2.3.1. Factorial validity

Factor analysis is a statistical data reduction technique commonly used in psychology for development of measurement scales (e.g. personality scales) and in survey research (144,145). This statistical technique is used in theory development to clarify correlations between specific outcomes (e.g. scale items) as a result of

underlying factors. It is also used for data reduction – large numbers of variables are reduced to smaller number of factors. Each factor addresses an underlying concept that is measured with more than one variable (e.g. multiple questionnaire items). Initially, researchers start with a large number of questionnaire items that they assume correspond to the constructs that they wish to address. Once data are collected, the first factor analysis is performed and some items are removed or added based on the results. The revised instrument is distributed again to another group of study participants and the process continues until researchers refines the instrument in such a way that the items consistently load on several factors that correspond to constructs to be measured (144).

There are two types of factor analysis techniques – confirmatory factor analysis and exploratory factor analysis (146,147). Confirmatory factor analysis (CFA) is used to confirm the structure of factors; it examines whether correlational structure of variables matches the existing hypothesized structure suggested by previous research (147). On the other hand, exploratory factor analysis is used to explore factor structure when hypothesis about the structure is absent. Relationship between variables and how they group based on their correlations are examined in exploratory factor analysis (147). My study applied exploratory factor analysis to examine the structure of factors which was unknown.

6.2.3.1.1. Exploratory factor analysis methods

As part of psychometric testing, exploratory factor analysis (EFA) was performed on Part C of the questionnaire to examine how questionnaire items correlate with underlying constructs (i.e. CanMEDS-oriented global health competencies) (144,148). The factors (i.e. constructs) identified by factor analysis would ideally conceptually address CanMEDS global health competencies for physicians as hypothesized by the expert advisory group. Questionnaire items were expected to load on a single CanMEDS global health competency (physician as a communicator, collaborator, manager, health advocate, scholar, and professional).

Exploratory factor analysis is a statistical technique widely used in psychometric instrument development (148). The technique requires from a researcher to decide whether the EFA is the appropriate method to use and to determine which variables to include. Furthermore, model-fitting procedure, number of factors, and the rotation method for easier interpretation of the final solution need to be determined (148).

The steps for factor analysis proposed by Norusis were followed (149);

1. Computing of a correlation matrix to verify that the variables are related
2. Determination of the number of factors to be extracted in factor analysis
3. Transformation of factors (i.e. rotations) to make the results more interpretable
4. Computing of the scores for the identified factors that were used in further analysis.

6.2.3.1.2. Exploratory factor analysis results

The 18 items of *Global health competencies measurement scale* that assess competencies before international clinical experience were subjected to an EFA. Prior to conducting EFA, correlation matrix including all 18 items was examined for presence of correlation coefficients of 0.3 or greater (*Table 6-2*) (144). Bartlett's test of sphericity was statistical significant (317.984; $p<.001$) supporting factorability of the correlation matrix. In addition, Kaiser-Meyer-Olkin value was 0.48 almost reaching the recommended value of 0.5 (144,150,151). Based on these findings, it was appropriate to conduct EFA.

Table 6-2 Correlation of variables included in the factor analysis

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
1. I was comfortable building open and trusting relationships with my patients with different backgrounds.	1																	
2. I found it challenging to communicate effectively with my patients with different backgrounds.	-.137	1																
3. Listening actively to my patients' concerns was challenging.	-.195	.485*	1															
4. Expressing my ideas and concerns clearly was challenging.	.172	.224	.565*	1														
5. I was uncomfortable consulting with other health care professionals to address issues of my patients with different backgrounds.	.337*	.024	-.015	.094	1													
6. Addressing team disagreements related to care for patients with different backgrounds was challenging.	.146	.212	.076	.001	.549*	1												
7. I was comfortable building partnerships with medical and other professionals to benefit my patients with different backgrounds.	.234	.291*	.171	.164	.017	-.091	1											
8. It was challenging to provide medical care to my patients with different backgrounds.	-.041	.238	.370*	.322*	.030	.193	-064	1										
9. I was able to understand perspectives of my patients with different backgrounds	.497*	.134	-.112	.011	-.119	-.156	.315*	-.074*	1									

* Pearson correlation coefficient p-value significant at <0.05

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
10. I was sometimes unable to provide the highest quality of care to my patients due to their educational, socioeconomic and cultural backgrounds.	.176	-.098	.045	.165	.306*	.186	-.164	.220	.093	1								
11. It was challenging to discuss sensitive issues (e.g. alcohol, drugs, sexual issues) with my patients with different backgrounds.	.126	.171	-059	-.023	.250	.342*	.003	.343*	.181	.299*	1							
12. I found it challenging to identify needs of my patients with different backgrounds.	.205	.295*	.214	0.187	.047	.281*	.113	.437*	.189	.322*	.354*	1						
13. I was aware of the medical services available to my patients with different backgrounds.	.209	-.183	-.312*	-.077	.251	.175	-.019	-.154	-.109	-.149	-.047	-.209	1					
14. I was effective in completing my responsibilities in the medical clinic when working with my patients with different backgrounds.	.005	-.114	-.094	.071	.242	.134	.249	-.066	-.001	.169	-.038	-.004	.126	1				
15. Helping my patients with different backgrounds to set realistic goals for their health was challenging within available time.	-.073	.137	.143	.348*	.196	.035	.041	.147	.119	.202	.170	.004	-.131	-.169	1			
16. I know how to use the expertise of nurses and other health professionals when working with my patients with different backgrounds.	-.066	-.150	-.231	.157	.124	.067	-.037	.017	-.317*	-.003	-.119	-.189	.636*	.258	-.009	1		
17. I know how to access resources to keep up to date with global health issues.	.084	-.199	-.126	.045	.241	.163	.290*	-.005	-.048	.168	.114	0.200	0.230	.359*	-.105	.323*	1	
18. I actively participated in global health activities.	.149	.141	-.077	.056	.020	.105	.356*	.036	-.097	-.220	-.032	.120	.224	.114	-.143	.329*	.651*	1

* Pearson correlation coefficient p-value significant at <0.05

Three EFA were performed. In the first EFA, item 15 was removed from the scale due to its low loadings (<0.3) and low correlations with other items. In the second EFA, item 7 had cross-loadings with items 1 and 9 (*Communicator Scale*), and items 13, 14, 16, 17, and 18 (*Manager / Health advocate and Continuous learning subscales*). Since items 1 and 9 were consistently loading on the same factor with relatively high factor loadings, they were considered a separate scale and were removed from the final EFA to account for the cross-loading issue for item 7.

A final EFA was performed on 15 items, where six components with eigenvalues greater than 1, explaining between 7.8% and 18.9% of the variance. Evaluation of the scree plot gave ambiguous results (i.e. scree plot had several breaks in the slope). Parallel analysis was performed to confirm the number of factors to be extracted (152).This analysis identified four components with eigenvalues greater than the eigenvalues from the corresponding random data of the same size (15 variables and 88 respondents (Table 6-3), indicating that 4 factors should be retained.

Promax rotation was performed to facilitate the interpretation of the four factor loadings (144). The rotated solution indicated the presence of simple structure with strong loadings of items on four factors. All variables were loading strongly on only one factor, with the exception of items 8 and 14 which had lower factor loadings. The four-factor solution explained a total of 57.9% of the variance; factor 1 explained 18.9%, factor 2 17.8%, factor 3 12.2% and factor 4 explained 8.9% of the variance.

The following labels were used for the four factors:: *Communicator challenges* (items 2, 3, 4 and 8); *Medical professional challenges* (items 5, 6, 10, 11 and 12); *Manager*

and Health advocate (items 13, 14 and 16), and *Continuous learning* (items 7, 17, and 18). As mentioned above, items 1 and 9 were removed from the final factor analysis and they were considered a separate scale named *Communicator scale*. Factor loadings after Promax rotation for the *Global health competencies measurement scale,* its subscales and *Communicator scale* are presented in *Table 6-3.*

Mean global health scores were created for the overall 15-item Likert scale, for four subscales and for 2-item scale (questions 1 and 9). Responses from study participants who answered at least 50% of the eligible questions were included in the scores. These scores were used in the subsequent analyses, for example for comparing scores before and after international clinical experience.

Table 6-3 Factor loadings after Promax rotation for the *Global health competencies measurement scale* and *Communicator scale* (N=88)

		Factors 1	2	3	4
	Global health competencies measurement scale				
	Communicator challenges				
2	I found it challenging to communicate effectively with my patients with different backgrounds**. (Communicator)**	**0.47**			
3	Listening actively to my patients' concerns was challenging. **(Communicator)**	**0.88**			
4	Expressing my ideas and concerns clearly was challenging**. (Communicator)**	**0.73**			
8	It was challenging to provide medical care to my patients with different backgrounds. **(Medical professional)**	**0.36**			
	Medical professional challenges				
5	I was uncomfortable consulting with other health care professionals to address issues of my patients with different backgrounds. (**Collaborator)**		**0.56**		
6	Addressing team disagreements related to care for patients with different backgrounds was challenging. (**Collaborator)**		**0.60**		
10	I was sometimes unable to provide the highest quality of care tomy patients due to their educational, socioeconomic and cultural backgrounds. (**Medical professional)**		**0.55**		
11	It was challenging to discuss sensitive issues (e.g. alcohol, drugs, sexual issues) with my patients with different backgrounds. (**Medical professional)**		**0.61**		
12	I found it challenging to identify needs of my patients with different backgrounds. (**Health advocate)**		**0.48**		
	Manager / Health advocate				
13	I was aware of the medical services available to my patients with different backgrounds. **(Health advocate)**			**0.63**	
14	I was effective in completing my responsibilities in the medical clinic when working with my patients with different backgrounds**. (Manager)**			**0.31**	
16	I knew how to use the expertise of nurses and other health professionals when working with my patients with different backgrounds. **(Manager)**			**0.76**	
	Continuous learning				
7	I was comfortable building partnerships with medical and other professionals to benefit my patients with different backgrounds. **(Collaborator)**				**0.42**
17	I knew how to access resources to keep up to date with global health issues. **(Scholar)**				**0.66**
18	I actively participated in global health activities. **(Scholar)**				**0.89**
	% of variance explained	**18.9%**	**17.8%**	**12.2%**	**8.9%**
	Communicator scale				
1	I was comfortable building open and trusting relationships with my patients with different backgrounds. **(Communicator)**				
9	I was able to understand perspectives of my patients with different backgrounds. (**Medical professional)**				

* Item 15 was removed from factor analysis due to low factor loading (<0.3); also this question was double-barrelled.

6.2.3.2. Group differences at pretest

Study participants who attended IFMSA General Assembly in Montreal completed a retrospective pretest/posttest evaluation. To explore whether there is a difference between retrospective pretest scores and traditional pretest scores, additional data collection was performed. Questionnaires were administered to the University of Ottawa medical students who attended international elective pre-departure training. These study participants had no international clinical experience and they were asked to complete only the “Before” section of the instrument which was then used for comparison.

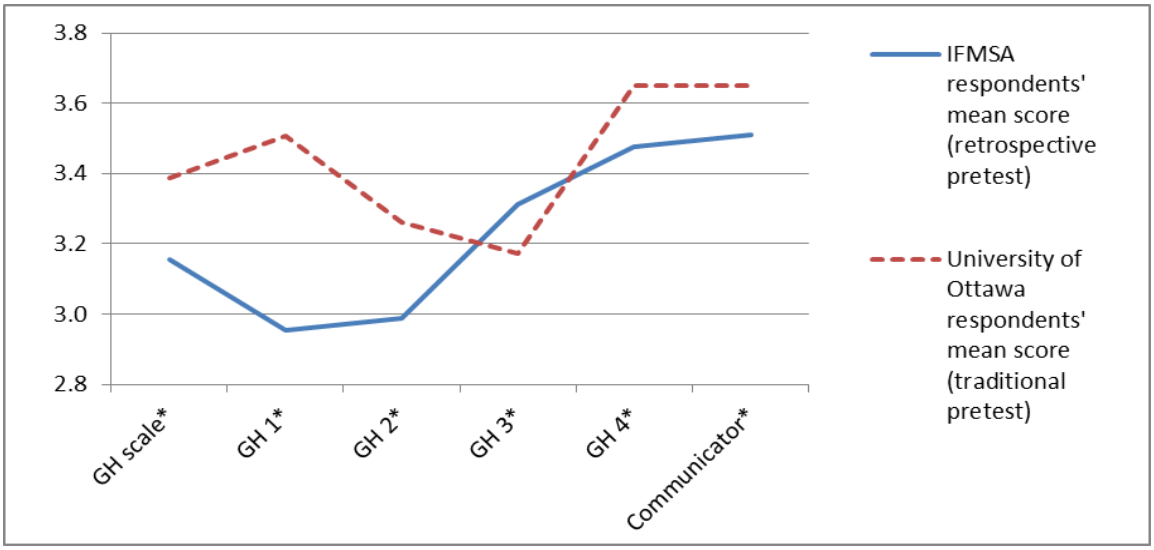
Independent t-tests were conducted to compare two groups of study participants. Responses provided to “*Before international clinical experience*” component were used in the analysis. The analyses compared mean scores for the scales, subscales and individual questions. A statistical correction of the significance level for multiple comparison t-tests was applied (138). The analysis after Bonferroni adjustment of alpha levels did not identify any significant differences in mean scores for instrument scales and subscales between University of Ottawa study participants and IFMSA participants (*Table 6-4, Figure 6-4*). When individual questionnaire items were compared for differences, only two out of 18 items had significantly different mean scores (item 1 IFMSA M=3.78, SD=0.80; U of Ottawa M=4.46, SD=0.58; p<0.001, d=-0.97; item 9 (IFMSA M=3.44, SD=0.84; U of Ottawa M=4.08, SD=0.64; p<0.001, d=-0.86) (*Table 6-5, Figure 6-5*).

Table 6-4 Mean score comparison for scales and subscales between IFMSA General Assembly participants and University of Ottawa respondents

	IFMSA General Assembly participants			University of Ottawa respondents			
	N	**Mean**	**SD**	**N**	**Mean**	**SD**	**p-value; Cohen's d***
Global health competencies measurement scale (excluding items 15, 1 and 9)	**75**	**3.16**	**0.45**	**27**	**3.39**	**0.46**	**p=.024 d=.50**
Communicator challenges subscale (items 2, 3, 4 and 8)	84	2.96	0.82	28	3.51	0.67	p=.002 d=.73
Manager/Health advocate subscale (items 13, 14 and 16)	75	2.99	0.64	25	3.26	0.66	p=.069 d=.40
Medical professional challenges subscale (items 5, 6, 10, 11 and12)	68	3.31	0.70	24	3.17	0.69	p=.410 d=-.20
Continuous learning subscale (items 7, 17 and 18)	74	3.48	0.83	28	3.65	0.55	p=.317 d=.24
Communicator scale (items 1 and 9)	**81**	**3.51**	**0.83**	**28**	**3.65**	**0.55**	**p=.322 d=.20**

* * Statistically significant at the Bonferroni adjusted alpha level = 0.001 (138);
d = Cohen's d effect size (139,140); p-values of .000 are reported as p<.001

Figure 6-4 Mean score comparison for scales and subscales between IFMSA General Assembly participants and University of Ottawa respondents



*GH scale = Global health competencies measurement scale; GH 1 = Subscale Communicator challenges; GH 2 =Subscale Manager/Health advocate; GH 3 = Subscale Medical Professional challenges; GH 4 = Subscale Continuous learning (items 7, 17 and 18); Communicator = Communicator scale (items 1 and 9)

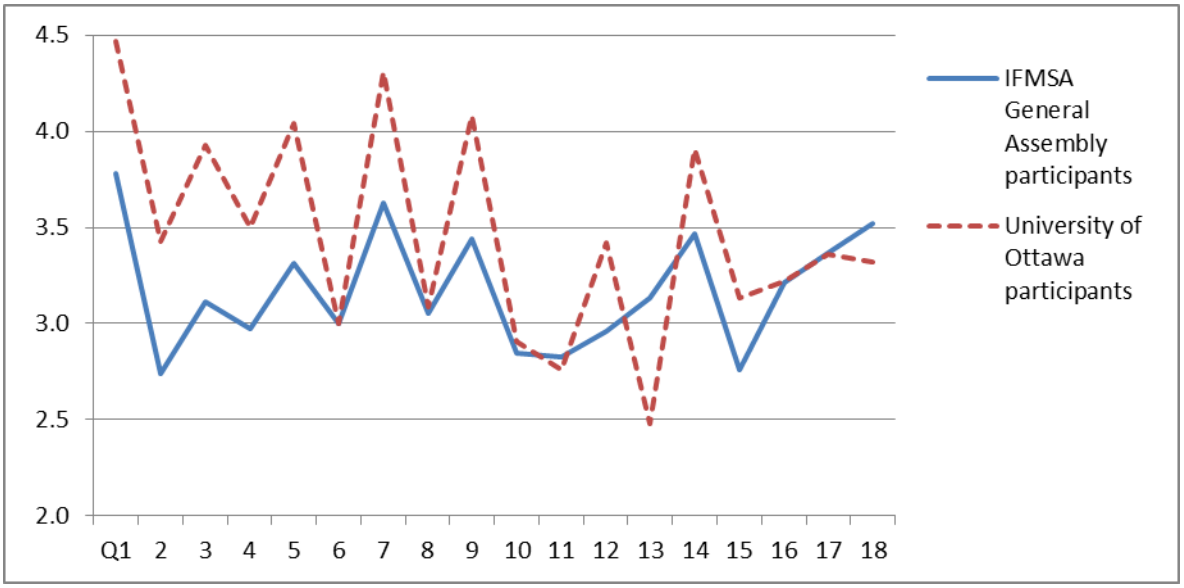
Table 6-5 Mean score comparison for individual question between IFMSA General Assembly participants and University of Ottawa respondents

	IFMSA General Assembly participants			University of Ottawa respondents			
	N	Mean	SD	N	Mean	SD	p-value; Cohen's d*
BEFORE 1. I was comfortable building open and trusting relationships with my patients with different backgrounds.	83	3.78	0.80	28	4.46	0.58	**p<.001** d=.97
2. I found it challenging to communicate effectively with my patients with different backgrounds. (Reversed)	85	2.74	1.05	28	3.43	1.00	p=.003 d=.67
3. Listening actively to my patients' concerns was challenging. (Reversed)	82	3.11	1.24	28	3.93	1.05	p=.002 d=.71
4. Expressing my ideas and concerns clearly was challenging. (Reversed)	82	2.98	1.02	28	3.50	0.84	p=.016 d=.56
5. I was uncomfortable consulting with other health care professionals to address issues of my patients with different backgrounds. (Reversed)	80	3.31	1.04	26	4.04	1.08	p=.003 d=.69
6. Addressing team disagreements related to care for patients with different backgrounds was challenging. (Reversed)	74	3.00	0.94	24	3.00	1.06	1.00 d=0
7. I was comfortable building partnerships with medical and other professionals to benefit my patients with different backgrounds.	72	3.63	1.04	26	4.31	0.74	p=.003 d=.75
8. It was challenging to provide medical care to my patients with different backgrounds. (Reversed)	74	3.05	1.05	23	3.09	1.12	p=.897 d=.04
9. I was able to understand perspectives of my patients with different backgrounds.	75	3.44	0.84	25	4.08	0.64	p=.001; d=.86
10. I was sometimes unable to provide the highest quality of care to my patients due to their educational, socioeconomic and cultural backgrounds. (Reversed)	72	2.85	1.07	22	2.91	1.19	p=.818 d=.05
11. It was challenging to discuss sensitive issues (e.g. alcohol, drugs, sexual issues) with my patients with different backgrounds. (Reversed)	74	2.82	1.05	25	2.76	1.09	p=-.794 d=-.06
12. I found it challenging to identify needs of my patients with different backgrounds. (Reversed)	69	2.96	1.01	26	3.42	0.90	p=.041 d=.48
13. I was aware of the medical services available to my patients with different backgrounds.	68	3.13	0.99	27	2.48	0.85	p=.003 d=-.70

	IFMSA General Assembly participants			University of Ottawa respondents			
	N	Mean	SD	N	Mean	SD	p-value; Cohen's d
14. I was effective in completing my responsibilities in the medical clinic when working with my patients with different backgrounds.	69	3.46	0.76	22	3.91	0.61	p=.014 d=.65
15. Helping my patients with different backgrounds to set realistic goals for their health was challenging within available time. (Reversed)	62	2.76	0.94	22	3.14	1.04	p=.117 d=.38
16. I know how to use the expertise of nurses and other health professionals when working with my patients with different backgrounds.	66	3.21	0.97	23	3.22	1.09	p=.983 d=.01
17. I know how to access resources to keep up to date with global health issues.	74	3.36	1.00	28	3.36	1.16	p=.974 d=0
18. I actively participated in global health activities.	75	3.52	1.28	28	3.32	0.86	p=.370 d=-0.18

* Statistically significant at the Bonferroni adjusted alpha level = 0.001 (138);
d = Cohen's d effect size (139,140); p-values of .000 are reported as p<.001

Figure 6-5 Mean score comparison for individual question between IFMSA General Assembly participants and University of Ottawa respondents



6.2.4. Internal consistency

The internal consistency of the scales and subscales was assessed with the reliability coefficient Cronbach's alpha. Spearman Brown coefficient was calculated for two-item *Communicator scale* (153). Cronbach's alpha will generally increase as the intercorrelations among test items increase, and is thus known as an internal consistency estimate of reliability of test scores (154). This coefficient is widely believed to indirectly indicate the degree to which a set of items measures a single unidimensional latent construct.

The overall Cronbach's alpha was calculated for the *Global health measurement scale* and subscales, and Spearman Brown coefficient for the *Communicator scale* (items 1 and 9). Alpha coefficients ranged from 0.61 (*Manager/Health advocate subscale*) to 0.71 (*Communicator challenges subscale*). The Global health measurement scale with 15 items had reliability coefficient of 0.64 which suggested moderate consistency. Cronbach's alpha reliability coefficients can be found in *Table 6-6*.

Table 6-6 Internal consistency (Cronbach's alpha) of the instrument

	α
Global health competencies measurement scale	**0.64**
SUBSCALES	
Communicator challenges (items 2, 3, 4 and 8)	0.71
Medical professional challenges(items 5, 6, 10, 11 and 12)	0.63
Manager / Health advocate (items 13, 14 and 16)	0.61
Continuous learning (items 7, 17 and 18)	0.63
Communicator scale (items 1 and 9)	**0.66***

* Spearman Brown formula used to estimate reliability

6.3. Discussion

Factor analysis results revealed four subscales (*Communicator challenges, Medical professional challenges, Manager/health advocate and Continuous learning subscale*), but also that negative and positive questionnaire items grouped together. For example the *Communicator scale* (items 1 and 9) and *Communicator challenges subscale* both cover similar construct, but one refers to presence of competencies whereas the second one refers to barriers to achieving these competencies. Positive and negative wording was used purposefully in the instrument to reduce acquiescence (155). Also, item 15 was identified as a poor item for the scale. This item appeared to be double barreled in nature and it had low correlations with all the factors. It is also important to note that the sample size for factor analysis was small. Factor analysis requires a minimum of 5 individuals per questionnaire item (75 would be needed to test 15 items), and the analysis in this study was completed on a sample of 88 individuals. This limitation should be acknowledged and further validity testing of the instrument should be performed.

The internal consistency for both scales and four subscales was satisfactory. Cronbach's alpha coefficients were moderate ranging from 0.61 to 0.71. In future validation of the instrument, additional questions could be added or existing questions could be rephrased to explore whether this would results in improved internal consistency.

On another note*, Communicator scale* has only two items which raises a question about appropriateness of Cronbach's alpha as some scholars believe that a correlation coefficient should be used. Hulin recommends using the Spearman Brown formula to assess the reliability instead of using Cronbach's alpha and this calculation was performed to calculate reliability of two item scale in this study (153).

An important part of the validation of the pretest items was a comparison between traditional and retrospective pretest scores. An intervention may impact understanding of underlying constructs that are being assessed, resulting in different pretest scores if the pretest was administered in a traditional fashion or retrospectively. Retrospective administration of a pretest may be biased by unreliable recall, effort justification, social desirability or implicit theory of change. Moreover, traditional pretest design can threaten internal validity because study participants may not have a sufficient understanding of the construct being evaluated. Also as a function of time and maturity (i.e. new knowledge gained) their traditional posttest evaluation may not be assessing the same construct

Collecting pretest data during General Assembly in Montreal from IFMSA members who did not have international clinical experience was considered, however it presented a challenge. The time allotted for the questionnaire completion was very limited. Also, collecting data about global health competencies from both IFMSA members with and without international clinical experience would involve creating a longer questionnaire with more complex instructions, which can be associated with lower response rates (121). Moreover, the questionnaire section consisting of global

health questions (Part C) was formatted to fit on one page in order to keep the questionnaire shorter (121). Extending this section by adding additional instructions or creating supplementary sections with questions for study participants without international clinical experience may have potentially confused participants as to which sections they were eligible to complete.

Alternatively, two types of questionnaires would need to be prepared based on participants' eligibility– a questionnaire with questions for study participants with international clinical experience and a questionnaire with questions for study participants without international clinical experience. Distribution of two questionnaire versions would require more administration time and human resources to screen participants for eligibility and to distribute the right questionnaire version. Due to unfeasibility of collecting data about global health competencies from IFMSA study participants, an additional group of study participants was identified to compare baseline values.

University of Ottawa medical students registered for pre-departure training were selected as their recruitment was feasible and acceptable alternative, yet they may not have been the perfect comparison group. IFMSA General Assembly participants were international medical students not necessarily interested in global health issues; whereas University of Ottawa study participants were recruited through elective educational session that prepared them for a global health experience. Higher results from University of Ottawa students may not only be explained by traditional pretest use, but also those students may have had more developed global health competencies than

IFMSA students who may be more representative of general medical student population.

Findings of comparisons between traditional and retrospective pretest identified only two significant differences in means scores for two individual questionnaire items. Traditional pretest values (University of Ottawa participants' mean scores) were generally higher than retrospective pretest values (IFMSA participants' mean scores). However, this analysis was performed using two different samples, therefore the interpretation should be done with caution. Preferably, traditional and retrospective pretest with control groups (i.e. Solomon design) followed by interviews should be administered to the same population. Evaluation of results obtained through such a design would provide a better information about the two study designs and reasons for lower or higher scores.

Chapter 7 Exploring self-perceived global health competencies among medical students before and after international clinical electives

7.1. Introduction

Literature suggests that participation in international clinical experiences is associated with improved global health competencies. One of the research questions of this study was whether this hypothesis is true in the selected sample and whether international experience will result in changes in self-perceived global health competency scores among IFMSA study participants.

7.2. Objectives

To evaluate a difference in self-perceived global health competencies' before and after international clinical experience based on self-assessed data collected after the international clinical experience.

7.3. Methods

IFMSA General Assembly participants were asked to answer questions about their competencies by using retrospective pretest/posttest design. Responses about their competencies before and after an international clinical experience were obtained. Mean scores were computed for scales and subscales identified by factor analysis. The

data were analysed using paired t-tests to assess for differences in before and after scores for scales, subscales and individual questions. A statistical correction to the alpha level for multiple comparison t-tests was applied (138).

7.4. Results

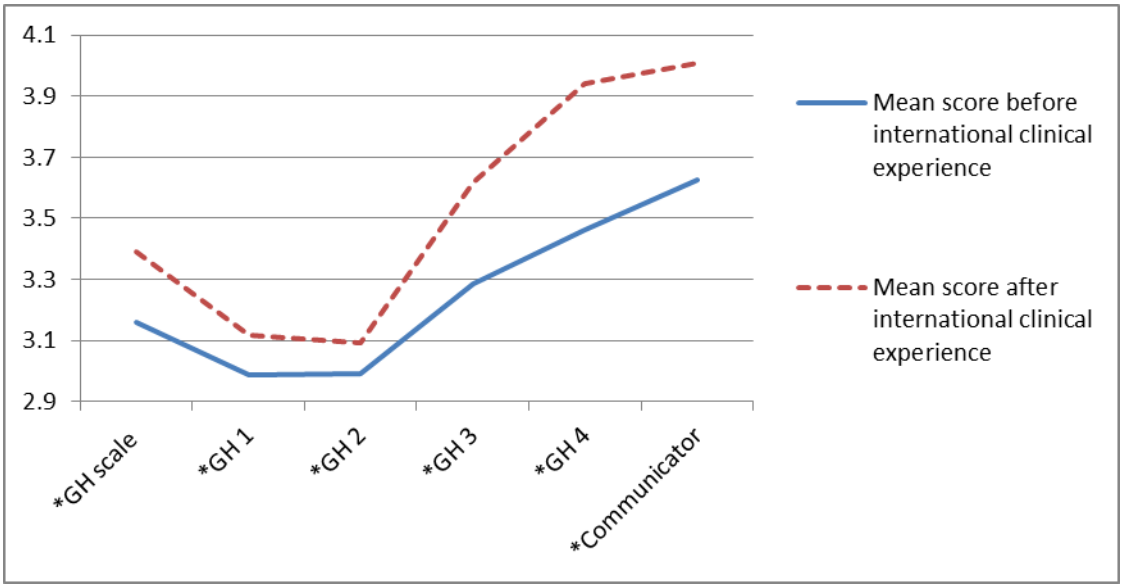
Paired t-tests were performed to assess the influence of international clinical experience on global health measures. Significant increases in scores were observed after international clinical experience for *Communicator scale* (Before *M*=3.63, *SD*=0.70; After *M*=4.01, *SD*=0.71; *p*<0.01), *Global health competencies measurement scale* (*M*=3.16, S*D*=0.46; *M*=3.39, *SD*=0.49; *p*<0.01); and for subscales *Manager / Health advocate* (*M*=3.29, *SD*=0.70; *M*=3.62, *SD*=0.72; *p*<0.01) and *Continuous learning* (*M*=3.46, *SD*=0.82; *M*=3.94, *SD*=0.76; *p*<0.01) (*Table 7-1, Figure 7-1*).

Table 7-1 Difference between mean scores before and after international clinical experience for scales and subscales

		Before international clinical experience		After international clinical experience		
	N	Mean	SD	Mean	SD	p-value*
Global health competencies measurement scale	71	3.16	0.46	3.39	0.49	<.001 d=.48
Communicator challenges subscale (items 2, 3, 4 and 8)	79	2.99	0.82	3.12	0.95	.059 d=.15
Medical professional subscale challenges (items 5, 6, 10, 11 and12)	70	2.99	0.66	3.09	0.76	.135 d=.14
Manager/Health subscale advocate (items 13, 14 and 16	65	3.29	0.70	3.62	0.72	<.001 d=.46
Continuous learning subscale (items 7, 17 and 18)	71	3.46	0.82	3.94	0.76	<.001 d=.61
Communicator scale (items 1 and 9)	79	3.63	0.70	4.01	0.72	<.001 d=.54

* Statistically significant at the Bonferroni adjusted alpha level = 0.001 (138);
d = Cohen's d effect size (139,140); p-values of .000 are reported as p<.001

Figure 7-1 Difference between mean scores before and after international clinical experience for scales and subscales



*GH scale = Global health competencies measurement scale; GH 1 = Subscale Communicator challenges; GH 2 =Subscale Manager/Health advocate; GH 3 = Subscale Medical Professional challenges; GH 4 = Subscale Continuous learning (items 7, 17 and 18); Communicator = Communicator scale (items 1 and 9)

Furthermore, individual items scores for before and after international clinical were evaluated. Significant increase in scores was observed for seven out of eighteen items; whereas a decrease for item 15 was observed, however this decrease was not significant (*Table 7-2*, *Figure 7-2*)

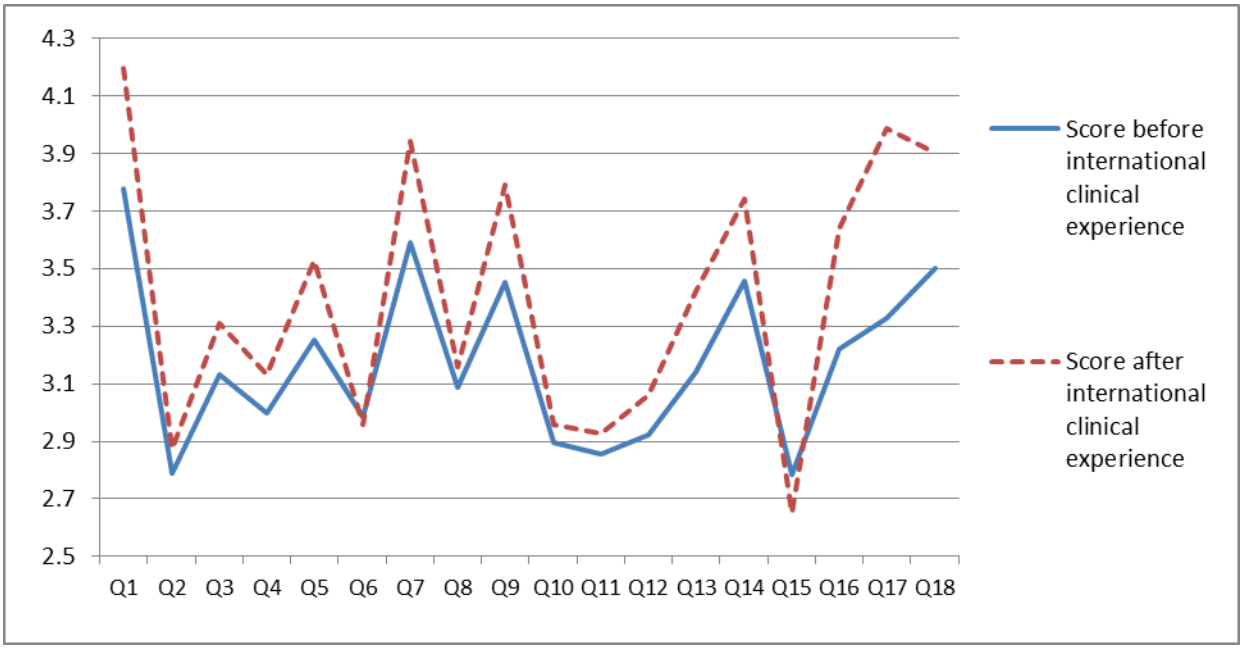
Table 7-2 Difference between mean scores before and after international clinical experience for individual items

	N	Before international clinical experience		After international clinical experience		p-value
		Mean	SD	Mean	SD	
1. I was comfortable building open and trusting relationships with my patients with different backgrounds.	77	3.78	0.80	4.19	0.74	**<.001*** d=.53
2. I found it challenging to communicate effectively with my patients with different backgrounds. (Reversed)	80	2.79	1.05	2.88	1.19	.348 d=.08
3. Listening actively to my patients' concerns was challenging. (Reversed)	77	3.13	1.22	3.31	1.19	.019 d=.15
4. Expressing my ideas and concerns clearly was challenging. (Reversed)	77	3.00	1.03	3.13	1.14	.260 d=.12
5. I was uncomfortable consulting with other health care professionals to address issues of my patients with different backgrounds. (Reversed)	72	3.25	1.07	3.53	1.17	.016 d=.25
6. Addressing team disagreements related to care for patients with different backgrounds was challenging. (Reversed)	70	2.99	0.96	2.96	1.04	.760 d=-0.03
7. I was comfortable building partnerships with medical and other professionals to benefit my patients with different backgrounds.	68	3.59	1.04	3.94	1.01	**<.001*** d=.34
8. It was challenging to provide medical care to my patients with different backgrounds. (Reversed)	70	3.09	1.05	3.16	1.16	.470 d=.06
9. I was able to understand perspectives of my patients with different backgrounds.	71	3.45	0.84	3.79	0.97	**<.001*** d=.37
10. I was sometimes unable to provide the highest quality of care to my patients due to their educational, socioeconomic and cultural backgrounds. (Reversed)	68	2.90	1.07	2.96	1.21	.469 d=.05
11. It was challenging to discuss sensitive issues (e.g. alcohol, drugs, sexual issues) with my patients with different backgrounds. (Reversed)	70	2.86	1.04	2.93	1.11	.533 d=.07
12. I found it challenging to identify needs of my patients with different backgrounds. (Reversed)	65	2.92	1.02	3.06	1.07	.162 d=.14
13. I was aware of the medical services available to my patients with different backgrounds.	64	3.14	0.97	3.42	0.91	.011 d=.30

	N	Before international clinical experience		After international clinical experience		p-value
		Mean	SD	Mean	SD	
14. I was effective in completing my responsibilities in the medical clinic when working with my patients with different backgrounds.	66	3.45	0.77	3.74	0.85	**<.001*** d=.36
15. Helping my patients with different backgrounds to set realistic goals for their health was challenging within available time. (Reversed)	60	2.78	0.94	2.65	0.97	.172 d=-0.14
16. I know how to use the expertise of nurses and other health professionals when working with my patients with different backgrounds.	64	3.22	0.98	3.64	1.07	**<.001*** d=.41
17. I know how to access resources to keep up to date with global health issues.	70	3.33	1.00	3.99	0.92	**<.001*** d=.69
18. I actively participated in global health activities.	70	3.50	1.25	3.90	1.12	**<.001*** d=.34

* Statistically significant at the Bonferroni adjusted alpha level = 0.001 (138);
d = Cohen's d effect size (139,140); p-values of .000 are reported as p<.001

Figure 7-2 Difference between mean scores before and after international clinical experience for individual items



7.5. Statistical power of the study

The main research question explored the differences between global health competencies scores before and after international clinical experience. It was very challenging to access student population with international clinical experience because of non-existence of a database of students who engage in such experience; therefore convenience sample was selected. IFMSA members attended a large meeting in Montreal and it was expected that a larger proportion of meeting attendees will have had international experience. The number of meeting attendees determined the potential sample size which was for that reason not calculated. The IFMSA board of directors confirmed that approximately 900 IFMSA members registered for General Assembly in Montreal, out of which a larger proportion was expected to have had international clinical experience, which was seen as a reasonable amount of potential study participants.

Power analysis can be performed *a priori* or *post hoc*. This analysis is performed to determine the necessary number of study participants to detect a desired effect size (*a priori*), or to verify whether the number of study participants obtained was sufficient to detect certain effect size. *A priori* power analysis uses estimated standard deviation and effect size; whereas *post hoc* power analysis uses the observed data. Onwuegbuzie and Leech advocate for the use of *post hoc* power analysis because it uses the observed data rather than the estimates (156). Moreover, in case of statistically non-significant study results, post hoc power analysis may provide explanation about

whether the statistical power in the study was insufficient (156).

Post hoc power analysis for the difference between two dependent means was conducted using G*Power 3 software to determine whether the number of study participants obtained through convenience sampling was sufficient to detect a medium effect size (157,158). This analysis was based on my main research question which evaluated whether there is a difference in before and after global health competencies based on *Global health competencies measurement scale* scores. The information entered into G*Power 3 software included level of significance, the mean effect size for *Global health competencies measurement scale and subscales*, and the mean total sample size. With alpha = .05, power .80 and medium effect size of .37 the required sample size is 60. Therefore, the current sample size (N=72) was adequate for paired t-test analysis.

7.6. Discussion

Overall, an increase in global health scores was observed for *Global health competencies measurement scale* and for the *Communicator scale*, for certain subscales and individual items for those who participated in an international experiences. This may suggest that international clinical experiences have a positive impact on global health competencies; however it is not possible to draw this conclusion with the available data. It is important to note that there may have been a great heterogeneity in international clinical experiences that study participants had engaged in.

For the purpose of this study, an international clinical experience was defined very broadly as an international clinical or professional exchange, elective, or rotation. These experiences are often not structured and completed without faculty's supervision or guidance. Furthermore, experiences in a low income country may have had a different impact on medical students' global health competencies than experiences in high income countries. Medical setting in which these experiences took place is another important factor that may influence global health competencies. Even within countries, clinical experience in an underserved rural area offer different learning opportunities than clinical experience in a clinical hospital in a major city. Still, the findings of this study indicate that international clinical experiences may have a positive effect on the competencies of medical students.

Chapter 8 Exploring the relationship between participants' characteristics and their self-assessment of global health competencies

8.1. Introduction

Participants' characteristics (i.e. their age, gender, level of medical training) may be associated with their global health competencies scores. Identifying factors related to global health competency scores can allow stakeholders to provide a better support to those individuals who are identified to have lower global health competencies scores. This support may be in a form of promotion of global health opportunities to specific target groups or it may include offering additional global health courses and other learning opportunities.

8.2. Objectives

To identify participants' characteristics that present good predictors for global health scores before and after an international experience.

8.3. Methods

A relationship between IFMSA General Assembly participants' characteristics and their global health competencies was evaluated. The outcome variables were measured before and after international clinical experience scores for two scales and

four subscales identified by the exploratory factor analysis. The predictor variables included GNI of country of studies, years of medical school completed, number of languages spoken, number of international clinical experiences, duration of international clinical experiences, socio-economic status during upbringing, and lowest GNI category of the country visited.

Initially, correlation analyses were performed for predictors and outcome variables. Correlation analysis verified relationships between predictor variables and outcome variables (global health scores before and after international clinical experience) to ensure that a relationship exists. Also, correlation coefficients between predictor variables were assessed for multicollinearity. If variables with high correlation coefficient were detected ($r > 0.7$), one of the predictors would be omitted from further regression analyses (144). Consequently, multiple linear regression analysis was conducted on outcome variables and predictor variables whose correlation with the outcome variable exceeded 0.10. The analyses were performed separately for scores referring to before and after international clinical experience.

8.4. Results

The relationships between participants' characteristics and outcome variables (i.e. global health scales) were evaluated using Pearson correlation coefficient. Correlations between all the variables were generally weak, however multicollinearity was not observed between predictor variables. Detailed correlation analyses results can be found in *Table 8-1* and *Table 8-2*.

Table 8-1 Correlations between participants' characteristics and global health scales and subscales *before* international clinical experience

	Participant's age	Gender	GNI of country of medical studies	Years of medical school completed	Languages	Number of international rotations	Duration of rotations	Socio-economic status	Lowest GNI of countries visited
Participant's age	1								
Gender	-0.08	1							
GNI of country of medical studies	0.20*	0.02	1						
Years of medical school completed	*0.30	0.16	0.15	1					
Languages	0.14	0.17	-0.02	-0.03	1				
Number of international rotations	0.22	-0.03	0.10	0.04	0.21	1			
Duration of rotations	0.20	-0.15	0.10	0.02	0.16	0.61**	1		
Socio-economic status	<-0.01	0.06	0.11	0.02	0.25*	0.30*	0.06	1	
Lowest GNI of countries visited	-0.22	0.04	-0.2*	0.02	0.20	<-0.26*	-0.10	-0.02	1
Global health competencies measurement scale (Before)	0.21	<-0.04	<-0.40**	<-0.18	0.07	0.18	0.05	<-0.04	0.13
Subscale Communicator challenges (Before)	0.16	-0.06	-0.24	-0.17	0.01	0.22	0.18	-0.04	-0.01
Subscale Medical Professional challenges (Before)	0.15	0.05	-0.39**	-0.13	0.15	0.09	<-0.12	-0.04	0.21
Subscale Manager/Health advocate (Before)	0.08	0.02	-0.08	-0.01	0.08	0.12	-0.06	0.03	0.17
Subscale Continuous learning (Before)	0.10	-0.11	-0.23	-0.08	-0.09	-0.01	0.11	-0.06	-0.05
Communicator scale (items 1 and 9) (Before)	-0.06	-0.08	-0.06	0.06	0.18	0.21	0.17	0.12	0.12

* Pearson correlation significant at <0.05; ** Pearson correlation significant at <0.01

Table 8-2 Correlations between participants' characteristics and global health scales and subscales *after* international clinical experience

	Participant's age	Gender	GNI of country of medical studies	Years of medical school completed	Languages	Number of international rotations	Duration of rotations	Socio-economic status	Lowest GNI of countries visited
Participant's age	1								
Gender	-0.09	1							
GNI of country of medical studies	0.26*	0.02	1						
Years of medical school completed	0.30*	0.15	0.15	1					
Languages	0.14	0.17	0.01	-0.03	1				
Number of international rotations	0.21	-0.04	0.09	0.03	0.22	1			
Duration of rotations	0.25	-0.15	0.06	0.02	0.19	0.65**	1		
Socio-economic status	<-0.01	0.06	0.09	0.02	0.27	0.32*	0.01	1	
Lowest GNI of countries visited	-0.22	0.08	-0.27*	0.03	0.22	-0.25	-0.11	-0.02	1
Global health competencies measurement scale (After)	0.18	0.03	-0.18	-0.19	0.28*	0.27*	0.22	-0.03	<0.01
Subscale Communicator challenges (After)	0.12	-0.01	-0.08	-0.26	0.19	0.22	0.20	-0.04	-0.16
Subscale Medical Professional challenges (After)	0.04	0.04	-0.21	-0.19	0.21	0.12	0.07	-0.09	0.23
Subscale Manager/Health advocate (After)	0.10	0.05	-0.01	-0.01	0.17	0.25	0.11	0.17	0.02
Subscale Continuous learning (After)	0.17	0.02	-0.11	0.14	0.04	0.04	0.13	-0.07	-0.12
Communicator scale (items 1 and 9) (After)	0.09	0.01	0.13	0.05	0.29*	0.18	0.36*	0.16	0.16

* Pearson correlation significant at <0.05; ** Pearson correlation significant at <0.01

8.4.1. Predicting scores before international clinical experience

A multiple linear regression was conducted between global health scores before international clinical experience and predictor variables whose Pearson correlation coefficients with the outcome variables were greater than 0.10. *Table 8-3* contains unstandardized and standardized regression coefficient β with the standard error, t-value and the level of significance. Furthermore, *Table 8-4* contains R^2 and adjusted R^2 values, degrees of freedom, F values and associated significance levels.

Participants' age, GNI of the country of their medical studies and years of medical school completed were significant predictors of *Global health competencies measurement scale* score before international clinical experience. Participant's age showed positive association with the *Global health competencies measurement scale* scores (standardized β=0.30); whereas GNI of the country of medical studies was negatively correlated (standardized β= - 0.36). Increase in GNI level of the country of medical studies by one was related with a decrease in *Global health competencies measurement scale* score by 0.36. Overall, 26% (21% adjusted) of the variability in this score was predicted by this model. The model was significantly different than zero, $F(5)= 4.57$, $p<0.001$.

Two independent variables (participant's age and GNI of country of medical studies) contributed significantly to prediction of *Subscale Medical professional challenges* score. Similarly to the *Global health competencies measurement scale*, participant's age was positively associated with the *Medical professional challenges*

scores (standardized β=0.36); whereas GNI of the country of medical studies showed negative relationship with the outcome variable (standardized β= - 0.40). The model predicted 31% (25% adjusted) of the variability in this score. Furthermore, the model was significantly different than zero, F (6)= 4.82, p<0.001.

Linear regression models for subscales *Communicator challenges, Continuous learning,* and for *Communicator scale* did not identify any statistically significant predictor variables (*Table8-3, Table 8-4*). Moreover, the model for s*ubscale Manager/Health advocate* was not significantly different than zero, F (2)= 2.70, p<0.07 (*Table 8-3, Table 8-4*).

Table 8-3 Multiple linear regression of global health scales scores before international clinical experience and predictor variables

Measure	Unstandardized coefficient β	s.e.	Standardized coefficient β
Global health competencies measurement scale (*Before*)			
Participant's age	0.07	0.03	0.30*
GNI of country of medical studies	-0.31	0.10	-0.36*
Years of medical school completed	-0.01	0.00	-0.23*
Number of international clinical experiences	0.07	0.07	0.12
Country visited with the lowest GNI	0.09	0.06	0.17
Subscale Communicator challenges			
Participant's age	0.07	0.05	0.18
GNI of country of medical studies	-0.24	0.16	-0.17
Years of medical school completed	-0.01	0.01	-0.19
Number of international clinical experiences	0.20	0.15	0.19
Duration of international clinical experiences	0.01	0.11	0.01

* p < .05

Measure	Unstandardized coefficient β	s.e.	Standardized coefficient β
Subscale Medical Professional challenges			
Participant's age	0.12	0.04	0.36*
GNI of country of medical studies	-0.48	0.13	-0.40*
Years of medical school completed	-0.01	0.00	-0.18
Languages	0.07	0.08	0.10
Duration of international clinical experiences	-0.13	0.07	-0.21
Country visited with the lowest GNI	0.14	0.08	0.18
Subscale Manager/Health advocate			
Number of international clinical experiences	0.14	0.11	0.16
Country visited with the lowest GNI	0.23	0.10	0.27*
Subscale Continuous learning			
Participant's age	0.01	0.05	0.04
Gender	-0.08	0.21	-0.05
GNI of country of medical studies	-0.40	0.20	-0.25*
Duration of international clinical experiences	0.06	0.11	0.07
Communicator scale			
Languages	0.10	0.09	0.12
Number of international clinical experiences	0.19	0.13	0.21
Duration of international clinical experiences	-0.02	0.10	-0.03
Socio-economic status during upbringing	0.06	0.14	0.05
Country visited with the lowest GNI	0.09	0.09	0.12

*$p < .05$

Table 8-4 Multiple linear regression of global health scales scores before international clinical experience and predictor variables

Measures	Mean	SD	N	R	R Square	Adjusted R Square	Std. Error of the Estimate	df	F	p-value*
Global health competencies measurement scale (*Before*)	3.17	0.46	70	0.51	0.26	0.21	0.41	5	4.57	<.001
Participant's age	23.44	2.00	70							
GNI of country of medical studies	3.64	0.54	70							
Years of medical school completed	8.23	19.39	70							
Number of international clinical experiences	1.61	0.80	70							
Country visited with the lowest GNI	2.30	0.86	70							
Subscale Communicator challenges	2.94	0.80	80	0.35	0.12	0.06	0.78	5	2.08	.077
Participant's age	23.41	2.05	80							
GNI of country of medical studies	3.65	0.55	80							
Years of medical school completed	7.73	18.18	80							
Number of international clinical experiences	1.58	0.78	80							
Duration of international clinical experiences	2.26	0.99	80							
Subscale Medical Professional challenges	2.99	0.65	70	0.56	0.31	0.25	0.56	6	4.82	<.001
Participant's age	23.44	2.00	70							
GNI of country of medical studies	3.64	0.54	70							
Years of medical school completed	8.26	19.39	70							
Languages	2.46	0.90	70							
Duration of international clinical experiences	2.29	1.04	70							
Country visited with the lowest GNI	2.30	0.86	70							

Measures	Mean	SD	N	R	R Square	Adjusted R Square	Std. Error of the Estimate	df	F	p-value
Subscale Manager/Health advocate	3.30	0.70	67	0.28	0.08	0.05	0.69	2	2.70	.075
Number of international clinical experiences	1.66	0.83	67							
Country visited with the lowest GNI	2.28	0.85	67							
Subscale Continuous learning	3.51	0.84	69	0.27	0.07	0.01	0.83	4	1.23	.309
Participant's age	23.39	2.17	69							
Gender	1.39	0.49	69							
GNI of country of medical studies	3.68	0.53	69							
Duration of international clinical experiences	2.23	0.99	69							
Communicator scale	3.64	0.68	81	0.27	0.07	0.01	0.68	5	1.20	.320
Languages	2.42	0.86	81							
Number of international clinical experiences	1.59	0.79	81							
Duration of international clinical experiences	2.23	1.00	81							
Socio-economic status during upbringing	2.33	0.57	81							
Country visited with the lowest GNI	2.25	0.87	81							

* p-values of .000 are reported as p<.001

8.4.2. Predicting scores after international clinical experience

A multiple linear regression was performed between global health scores after international clinical experience and predictor variables. Predictors whose correlation coefficients with the outcome variable were greater than 0.10, were included in regression analysis. Unstandardized and standardized regression coefficient β with the standard error, t-value and level of significance are presented in *Table 8-5*. Furthermore, *Table 8-6* displays R^2 and adjusted R^2 values, degrees of freedom, F values and associated significance levels.

Only one significant predictor variable was identified in linear regression models for each of the following dependent variables – scales *Global health competencies measurement scale* and *Communicator scale* and for subscale *Medical professional challenges* (*Table 8-5, Table 8-6*).

The model with six predictors explained 20% (12% adjusted) in the variability of the *Global health competencies measurement scale* scores; GNI of country of medical studies being the only significant predictor. The model was significantly different than zero, F (6)= 2.53, p=0.03. GNI of the country of medical studies was negatively correlated (standardized β= - 0.28) with the outcome variable. Increase in GNI level of a country of medical studies by one (e.g. from upper middle income to high income) was associated with a decrease in *Global health competencies measurement scale* score by 0.28 (*Table 8-5, Table 8-6*).

Prediction model for *Medical professional challenges* scores identified country visited with the lowest GNI as the only significant predictor variable. Positive relationship is observed between GNI of country visited and *Medical professional challenges* score (standardized β= - 0.28); increase in GNI level of country visited by 1 is associated with an increase in *Medical professional challenges* score by 0.28. The model predicted 17% (10% adjusted) of the variability in *Medical professional challenges* scores. Furthermore, the model was significantly different than zero, F (5)= 2.43, p=0.04 (*Table 8-5, Table 8-6*).

Multiple linear regression between predictor variables and dependent variable *Communicator scale* score identified one significant predictor (duration of international clinical experiences). This predictor variable was positively associated with the outcome variable (standardized β= - 0.42). The model explained 19% (12% adjusted) in the variance of *Communicator scale* score. Moreover, the model was significantly different than zero, F (6)= 2.71, p=0.02 (*Table 8-5, Table 8-6*). However, the model for subscale *Communicator challenges* was not significantly different than zero, F (6)= 1.84, p=0.10.

Table 8-5 Multiple linear regression of global health scales scores after international clinical experience

Measure	Unstandardized coefficient β	s.e.	Standardized coefficient β
Global health competencies measurement scale (*After*)			
Participant's age	0.03	0.03	0.11
GNI of country of medical studies	-0.26	0.11	-0.28*
Years of medical school completed	0.00	0.00	-0.19
Languages	0.07	0.06	0.13
Number of international clinical experiences	0.16	0.10	0.27
Duration of international clinical experiences	-0.03	0.08	-0.06
Subscale Communicator challenges			
Participant's age	0.05	0.06	0.11
Years of medical school completed	-0.01	0.01	-0.28*
Languages	0.05	0.13	0.04
Number of international clinical experiences	0.26	0.18	0.22
Duration of international clinical experiences	-0.01	0.14	-0.01
Country visited with the lowest GNI	0.00	0.13	0.00
Subscale Medical Professional challenges			
GNI of country of medical studies	-0.17	0.16	-0.13
Years of medical school completed	-0.01	0.00	-0.17
Languages	0.06	0.10	0.07
Number of international clinical experiences	0.18	0.12	0.20
Country visited with the lowest GNI	0.25	0.12	0.28*

*p < .05

Measure	Unstandardized coefficient β	s.e.	Standardized coefficient β
Subscale Manager/Health advocate			
Participant's age	0.00	0.04	0.01
Languages	0.08	0.10	0.11
Number of international clinical experiences	0.17	0.16	0.20
Duration of international clinical experiences	-0.01	0.12	-0.02
Socio-economic status during upbringing	0.08	0.18	0.07
Subscale Continuous learning			
Participant's age	0.04	0.05	0.12
GNI of country of medical studies	-0.23	0.18	-0.17
Years of medical school completed	0.00	0.00	0.13
Duration of international clinical experiences	0.04	0.10	0.06
Country visited with the lowest GNI	-0.07	0.11	-0.08
Communicator scale			
GNI of country of medical studies	0.00	0.13	0.00
Languages	0.10	0.09	0.13
Number of international clinical experiences	-0.16	0.14	-0.18
Duration of international clinical experiences	0.29	0.11	0.42*
Socio-economic status during upbringing	0.26	0.15	0.21
Country visited with the lowest GNI	0.10	0.09	0.13

*p < .05

Table 8-6 Multiple linear regression of global health scales scores after international clinical experience

Measures	Mean	SD	N	R	R Square	Adjusted R Square	Std. Error of the Estimate	df	F	Sig.
Global health competencies measurement scale (*After*)	3.39	0.50	68	0.45	0.20	0.12	0.47	6	2.53	.030
Participant's age	23.53	2.13	68							
GNI of country of medical studies	3.63	0.54	68							
Years of medical school completed	8.41	19.65	68							
Languages	2.46	0.90	68							
Number of international clinical experiences	1.62	0.81	68							
Duration of international clinical experiences	2.28	1.02	68							
Subscale Communicator challenges	3.13	0.95	77	0.37	0.14	0.06	0.92	6	1.84	.103
Participant's age	23.45	2.13	77							
Years of medical school completed	7.88	18.52	77							
Languages	2.44	0.88	77							
Number of international clinical experiences	1.60	0.80	77							
Duration of international clinical experiences	2.25	0.99	77							
Country visited with the lowest GNI	2.19	0.89	77							
Subscale Medical Professional challenges	3.09	0.77	67	0.41	0.17	0.10	0.73	5	2.43	.045
GNI of country of medical studies	3.60	0.58	67							
Years of medical school completed	8.48	19.79	67							
Languages	2.46	0.91	67							
Number of international clinical experiences	1.61	0.82	67							
Country visited with the lowest GNI	2.28	0.85	67							

Measures	Mean	SD	N	R	R Square	Adjusted R Square	Std. Error of the Estimate	df	F	Sig.
Subscale Manager/Health advocate	3.60	0.71	63	0.26	0.07	-0.01	0.71	5	0.86	.513
Participant's age	23.79	2.27	63							
Languages	2.46	0.93	63							
Number of international clinical experiences	1.68	0.84	63							
Duration of international clinical experiences	2.33	1.03	63							
Socio-economic status during upbringing	2.30	0.59	63							
Subscale Continuous learning	3.97	0.73	67	0.26	0.07	-0.01	0.73	5	0.86	.512
Participant's age	23.34	2.10	67							
GNI of country of medical studies	3.66	0.54	67							
Years of medical school completed	8.37	19.82	67							
Duration of international clinical experiences	2.24	1.00	67							
Country visited with the lowest GNI	2.24	0.87	67							
Communicator scale	4.03	0.69	75	0.44	0.19	0.12	0.65	6	2.71	.020
GNI of country of medical studies	3.60	0.59	75							
Languages	2.45	0.89	75							
Number of international clinical experiences	1.59	0.79	75							
Duration of international clinical experiences	2.25	1.00	75							
Socio-economic status during upbringing	2.35	0.56	75							
Country visited with the lowest GNI	2.21	0.87	75							

8.5. Discussion

Multiple linear regression analysis was performed to identify potential predictors of global health scores. The analysis revealed several significant predictors of global health scales and subscales scores. Still, these models explained only a small proportion of the variance in global health scores.

Global health scale scores for before international clinical experience had more than one significant predictor variable. Predictors precede the event (i.e. international clinical experience); however in this analysis post-event predictors were also included. Inclusion of post-event predictors may have lowered the power and made confidence intervals wider; however they did not affect the results (none of the post-event predictors were significant). This was done in order to verify that the inclusion of post-event predictors will not result in unexpected results, such as post-event predictors being significant in the logistic regression.

On the other hand, global health scale scores after international clinical experience were predicted by a single significant predictor. Interestingly, the predictor variables identified for global scales and subscales do not overlap for before and after global health scores. For example, *Global health competencies measurement scale* scores *before* international clinical experience were significantly predicted by participant's age and GNI of the country of medical studies; whereas the same score *after* international clinical experience was significantly predicted only by GNI of the country of medical studies. Furthermore, GNI of the country of origin was negatively

correlated with scores before and after the experience; which suggests that students form high income countries evaluate their global health competencies as poorer than participants from low income countries.

Increase in age was positively associated with several scale and subscale scores. Older students may have had more training which can explain this score. Duration of international clinical experiences was a positive predictor of *Communicator scale* after international clinical experience implying that longer international rotations may be better learning opportunities than shorter ones. GNI of the country visited was positively correlated with *Medical professional challenges subscale* score after international clinical experience. Students who visited countries that belong to higher GNI category were more likely to assess the mentioned subscale scores as higher, which is not consistent with our hypothesis that experiences in countries with lower income is related to greater global health learning. It could be that students who visited countries belonging to the lower GNI category felt that their skills were not sufficient to competently practice medicine in low resource environment and they may have underestimated their competencies. On the other hand, students who visited high income countries may have overestimated their global health competencies as it is possible that they were not aware of the knowledge and skills that are needed to practice medicine in settings with limited resources. Findings of this analysis provide indications about factors that may improve global health competency scores and they should be considered in future research.

Chapter 9 Discussion and conclusions

9.1. Discussion

In the world of health disparities, global health has an important role. International clinical experiences are only one but important way of improving global health competencies among future physicians. This study conducted among international medical students showed that such experiences have positive influence on self-perceived global health skills and knowledge, and that it is possible to identify facilitators and barriers for these opportunities.

This study contributed important knowledge that should be taken into consideration when planning global health curricula. For instance, lack of opportunities and financial reasons were identified by medical students as main obstacles to gaining valuable international clinical experience. Having this in mind, medical schools may plan funding opportunities for students to enable them to extend their global health competencies. Also, more senior students from richer countries and those in higher years of medical school were more likely to participate in international clinical experience.

Furthermore, this study results suggest that participation in international clinical experience improves self-perceived global health competencies. International clinical experiences are highlighted as an important teaching approach when transferring global

health knowledge. Lastly, the study contributed a newly developed tool with preliminary psychometric properties. The tool showed good reliability and it can be further validated and used to evaluate global health curricula.

Still, the results of this study should be interpreted with caution due to several limitations. Generalizability of the study results depends on the representativeness of a sample. This study utilized a convenience sample therefore generalization of the results would not be appropriate. The convenience sample, a form of non-probability sampling, is a convenient and cheap way to select study participants; however it has its drawbacks. It is viewed as an inferior method to choose study participants compared to selection methods that use randomization. The probability of study participants to be included in a convenience sample cannot be determined, which impacts the generalizability of study results.

A convenience sample (also known as opportunity, accidental or grab sampling) was selected for this study due to inaccessibility of a study population of interest and unfeasibility of random sampling. By selecting a convenience sample, the sample size of the study population was determined by sampling frame; specifically, the final sample size was determined by attendees of IFMSA General Assembly sessions during which the survey was administered.

IFMSA study participants were not a randomly selected sample, certain selection bias was introduced so the participants were not necessarily representative of international medical students in general. These individuals are probably more involved with the work of international medical student organization which is not necessarily the

case for medical students in general. Also, they attended an international conference that involved a costly travel; therefore their socio-economic status may be higher than socio-economic status of students that may have been recruited if a random sample was selected. Furthermore, they may be more opened to international experiences that their peers.

Similarly, the sample of Canadian medical students and trainees who had interest in global health may not be representative of all Canadian medical students and trainees, and they also might have been significantly different from IFMSA members included in the study. However, administering the questionnaire through IFMSA allowed me to obtain information from a large number of medical students whose responses can be grouped and compared according to their characteristics.

Another issue in this study is the heterogeneity of the intervention being evaluated and the time that passed between the intervention and the evaluation. The intervention could have been structured or non-structured international experience which could potentially result in different learning experiences. Also, a difference in the results could have been observed if the international experience happened relatively recently or remotely as data this data was not collected.

Several types of analysis were performed in this study; namely paired and independent t-tests, chi square, exploratory factor analysis, Cronbach's alpha reliability coefficient calculation, correlation analysis, and logistic and multiple linear regressions. In order to have a satisfactory confidence (e.g. 95%) in representativeness of the data, certain sample size needs to be reached for each of these analyses. For example factor

analysis requires a minimum of 5 study participants per instrument item for the results to be meaningful. This study analyzed 15 items, so the minimum required number of study participants would be 75; this number was exceeded by 88 study participants whose responses were included in this analysis. Furthermore, *post hoc* power analysis for the main research question, the difference between *Global health competencies measurement scale* scores before and after international clinical experience, suggested that the sample size used in this study was adequate. Still, the use of convenience sample does not allow for generalization of the study findings.

Study design is another source of bias in this study. Biased responses may have been provided due to underestimate or overconfidence about self-perceived skills and the need to provide socially desirable answers. Since it was not feasible to administer the questionnaire before and right after the international clinical experience, recall bias may have occurred. Also, a response-shift bias towards reporting of higher self-perceived skills after the international experience is possible due to the exaggeration of the effect of the international elective. Furthermore, there is a correlation between the present state (i.e. current global health knowledge) and the retrospective responses. If students were exposed to the recent global health training that is not related to the international clinical elective (i.e. global health course, rural elective, training in underserviced area), they may systematically report better global health skills (110).

The questionnaire was offered only in English, the official language of the General Assembly. Some IFMSA members may not have been fluent enough in English to understand the questionnaire, which introduced additional bias into this study. IFMSA

members invited to an IFMSA general assembly came from nearly 100 countries. Due to the limited budget and data collection mode selected, it was not feasible to account for such linguistic diversity and to have the questionnaire translated and administered to study participants in the language of their choice.

IFMSA General Assembly presented a unique opportunity to collect data from international medical students and their self-perceived global health skills. Despite its limitations, findings of this study provide an original contribution to medical education research in global health.

9.2. Recommendations for future research

This study touches upon some issues related to global health training opportunities. It provides information about barriers and facilitators of global health experiences, as well as validation information of a measurement scale. Taken into consideration limitations of this study such as convenience sample that was used and retrospective design, future research should aim to use stronger study design with control groups. Also, the use of both retrospective pretest/posttest design and traditional pretest/posttest design among comparable groups would be recommended to evaluate for response-shift bias. Moreover, this study was conducted with a relatively small sample; therefore validation of the instrument as well as other findings should be further confirmed with a bigger sample.

9.3. Value of the study

This study provided important information about a self-report assessment tool developed to assess global health competencies among medical students, and it also obtained self-reports on the impact of international electives on global health competencies among medical students and their effectiveness when working with people with different backgrounds. These results will be made available to organisations and academics developing global health electives or designing special preparation modules for medical students planning an international clinical experience. Moreover, this questionnaire may be used as an assessment tool for educational global health interventions in order to help improve global health education.

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APPENDICES

Appendix A Global Health medical education at Canadian universities

University of Alberta Faculty of Medicine and Dentistry

Division of Community Engagement and *Global Health Initiative* of the University of Alberta Faculty of Medicine and Dentistry promote students and faculty education on international health, international health research and development projects (42,159). The Faculty encourages international electives, and it offers assistance to students with arranging desired electives; it provides pre-departure training and offers bursaries (42). Global health office organizes *Global Health Rounds* with a common theme “health of the poor” which are held every Monday from September until June, as well as annual *Global Health Photo Contest* and a fundraiser *Rich Man Poor Man* dinner (42). The global health website also contains reading materials on global health topics, planned curriculum, and other valuable information that can help students to arrange and to prepare for their international elective (42).

University of British Columbia Faculty of Medicine

University of British Columbia (UBC) Faculty of Medicine Division of Global Health offers many global health opportunities to undergraduate and postgraduate

medical trainees and it maintains a very resourceful website (43). The UBC Division of Global Health is working towards incorporating global health in the undergraduate medical curriculum (43). Participation in international electives is seen as beneficial and undergraduate medical students are encouraged to apply for international exchange through International Federation of Medical Students Association (IFMSA) Exchange Program (43). Workshops on topics like advocacy, major impact issues (e.g. water, sanitation), ethics and pre-departure training and participation in development projects are some of the opportunities available at the UBC (43).

The UBC Department of Family Medicine is the first in Canada to offer Aboriginal residency program to those interested in Aboriginal health issues and work with Aboriginal communities (160). In addition, family medicine residents can continue their third year of training enhancing their skills in global health (43). Moreover, an online credited course in international surgery is available through the Department of Family Practice. Tools such as *Global Health Electives Database* can be used by interested residents to search for available electives and research projects in developing countries (43).

University of Calgary Faculty of Medicine

University of Calgary Faculty of Medicine endorses medical students to participate in international electives and clinical clerkships in developing countries (161). The Faculty provides easy to follow step-by-step guide on how to arrange these placements (162). It also offers funding to a limited number of medical students and it

suggests alternative funding sources. Additionally, the University of Calgary family medicine residents can participate in a 12-month Global Health program (163). The global health objectives to be met during this program follow CanMEDS framework (47,52). Highlights of this comprehensive program are work with marginalized populations, addressing health inequities and working internationally in low-resource settings (163). Global health office at University of Calgary has partnerships with other universities and research institutions and they work together towards a common goal by organizing conferences, arranging overseas teaching opportunities, and student and faculty exchange.

University of Manitoba Faculty of Medicine

Manitoba is Canadian province with the highest proportion of Aboriginal people (164). The Aboriginal people composed 13.6% of the Manitoba population in 2011 totalling 150,040 individuals of Aboriginal descent (164). The Aboriginal population in Manitoba has much lower life expectancy compared to the national average – males live 7.4 years shorter and females 5.2 years, this difference is particularly noticeable on reserves (164). The health indicators of this population are very poor – suicide rates are 5 times higher than the national average, diabetes rates are 4.2 times higher among status Indians in Manitoba, tuberculosis incidence rates 6.5 times higher, HIV/AIDS 10.7 times higher, and injury and poisoning are the leading cause of death (164,165).

University of Manitoba Faculty of Medicine recognized Aboriginal health as one of the important health concerns in Manitoba and it is focusing its global health activities

on that population (39). Throughout their medical curriculum, Aboriginal health issues are emphasized during learning modules as around 50% of hospital patients associated with the medical campus are Aboriginal peoples. The Faculty also offers elective clerkship rotations with the emphasis on Aboriginal health in remote northern or rural communities (166). Students live in the community and learn about the Aboriginal community's life, their culture, history and socioeconomic conditions. The placements are held in primary care and public health units. There is also an opportunity to learn more about the Aboriginal culture through an elective about traditional knowledge and teaching (e.g. healing practices) (166). Students participate in traditional ceremonies and activities, and their clinical placements are held in settings where clinical practice is integrated with traditional knowledge (166). Furthermore, University of Manitoba offers residency positions in family medicine in rural and remote northern communities (167) (168). University of Manitoba's medical curriculum is an example of how global health can be integrated into medical curriculum in the local context (39).

Dalhousie University Faculty of Medicine

The Global Health Office at Dalhousie University Faculty of Medicine is dedicated to improving global health issues by offering global health learning experiences to students in medicine, dentistry and health professions; by supporting faculty members in their global health initiatives; and by participating in numerous global health projects and research (169). The office offers undergraduate electives in global health locally (e.g. northern electives, research electives, global health courses) and internationally

(e.g. summer programs in Tanzania and Thailand, partner electives and independent electives). It also organizes activities such as journal club, café scientifique, global health research forum and workshops (169). Additionally, students may apply for a bursary for a global health elective. A pre-departure orientation session is available, and it must be completed by students participating in the electives abroad (169).

Dalhousie University students are very active in global health and they coordinate several global health groups. The *Global Health Initiative* consists of health professional students who promote opportunities for medical students, global health and human rights and they also represent CFMS at the Dalhousie University (170). CMFS facilitates more than 100 research and clinical exchanges for Canadian medical students' through its membership with IFMSA (171). The *Global Health Initiative* also has the following committees: Global Health Committee, Aboriginal Health Interest group and Universities Allied for Essential Medicine (169). *Medical Equipment Recovery Initiative* (MERCI) is a student initiative that sends medical equipment (e.g. bandages, endoscopic disposables, gloves, catheters) to developing countries and so far they have helped with about $200,000 worth donations (169). Local Global Health Elective was initiated by medical students in 2009 and is now offered by the Global Health Office (169). This elective provides experience with disadvantaged populations and teaches about services that are available to them. The Global Health Office website is a precious source of ongoing activities and opportunities at Dalhousie University, and their 2009-2013 strategic plan ensures that the office will continue contributing to the field of global health (169).

McMaster University Michael G. DeGroote School of Medicine

The McMaster University has a Global Health Office that collaborates with the Faculty of Health Sciences MD Program (172). The office oversees international activities, supports health research, development and collaborations. The University also offers interdisciplinary cross-cultural Masters in Global Health Program (172). At the McMaster School of Medicine two groups of medical trainees are working on global health concerns - CFMS and Student Physicians for Global Survival and they form *Global Health Committee* (173). CFMS International Health Liaisons are elected yearly at all Canadian English speaking schools to oversee projects related to reproductive health, HIV and AIDS, public health and human rights (173). The *Global Health Committee* organizes global health activities such as speaker-series, journal clubs, fundraising, documentary screening, distribution of global health materials to Canadian medical schools, and recently translation services for immigrants and refugees (173). The Committee also organizes a pre-departure training for McMaster medical students prior to going to international electives (173). Global health initiatives are welcomed by the Department of Family Medicine which incorporating global health teaching sessions in its curriculum (173). At the postgraduate level, internal medicine residency program at the McMaster University School of Medicine offers an opportunity to complete an international clinical elective in Uganda (174).

Northern Ontario School of Medicine

The Northern Ontario School of Medicine (NOSM) *Global Health Interest Group* is a student-run organization aiming to reduce health disparities by engaging in global health activities in Canada and abroad (175). The group provides support to students when organizing international electives; specifically pre-departure training, logistical assistance and support upon return are offered. It is also interested in building partnership with other groups with similar interest and raising funds for global health initiatives (175). Events such as World AIDS Day and International Women's Day are organized to raise the awareness about certain global health issues. The interest group also elects two Global Health Liaisons who serve as facilitators of global health activities and as representatives of the program at the CFMS (175).

NOSM also maintains a website with international elective resources – information on how to organize an international elective, links to different organizations that provide useful information and to the travel clinic to ensure the students are vaccinated prior to their departure (176). It is important to mention that northern and rural health is one of the themes covered in the undergraduate curriculum, and collaboration with Aboriginal communities is fostered at both undergraduate and postgraduate level (177,178). Moreover, Northern Health Research Conference is organised annually by NOSM allowing students, residents and researchers to network and to share their experiences of global health at the local level (179).

Queen's University School of Medicine

The Office of Global Health at the Queen`s University School of Medicine offers many global health opportunities to medical students and residents (180). As a part of the global health curriculum, undergraduate students are able to participate in *Community Based Projects* in order to learn about the relationship between health and social services available in their community, as well as how to access those services to meet their patients' needs. Focus is on individuals with specific cultural background (e.g. Aboriginal, recent immigrants, minority religious and ethnic communities), individuals with low socioeconomic status (e.g. low income individuals, homeless, elderly, youth/adolescents) or those with specific medical conditions (e.g. oncologic, pregnancy, sexually transmitted diseases, alcoholism, substance abuse) (180). Another opportunity that global health curriculum offers is *Community Based Initiative* and the class project for 2014 is *Youth Diversion* in Kingston (180,181). Students get to participate in the work of organization that provides youth services to youth offenders such as empowering programs for youth, tutoring services to students suspended from school and mentorship program.

The Global Health Office also offers student placements in Tanzania, Kenya and Peru; pre-departure guide and training, pre-clerkship global health observerships; clerkship global health electives; as well as global health bursary (180). A *Global Health Certificate* is also available to interested Queen's students who participate in global health lectures, journal club or forum, attend pre-departure training and complete a global health observership or elective. *Global Health Elective Award* encourages

medical students to participate in international placement and to learn more about work with disadvantaged populations, social determinants of health and global health issues (41). The Global Health Office website contains calendar of events as well as other resources where students can find additional ideas on how to get engaged (180). Additionally, postgraduate training in global health is also available through the Department of Family Medicine (182).

University of Western Ontario Schulich School of Medicine & Dentistry

The University of Western Ontario Schulich School of Medicine & Dentistry offers *Medical Electives Overseas Program*, Clinical electives available to the fourth year students take place in Guatemala, Tanzania, Israel, Palestine, India, China and pre-clinical opportunities are organized in Tanzania, India and China (183). The purpose of the international electives is to learn about medical practice in low-resource setting, diseases specific to the area visited, and social, cultural and economic factors. Pre-departure-training and resources are available to students interested in international electives (183). Additionally, *Marginalized Community Selective* with focus on clinical experience with disadvantaged populations is offered to trainees that completed 3rd year or beyond. This clinical experience is provided as a part of selective, elective, family medicine rotation or third year of family medicine residency in partnership with local health clinics and community organizations (183).

Academic course on global health is offered to fourth year medical students to teach them about the factors that impact global health and how physicians can make a

difference (183). Students may join global health research projects or interest groups. Interest groups located on campus are *The Global & Ecosystem Health Interest Group* and *Hungry for Change*, or they can join CFMS–Global Health that provides Canadian medical students with global health opportunities (183,184). The University's *Global Health Funding Committee* offers financial assistance to students participating in global health elective, summer opportunities or attending conferences. Student may also receive one of six awards given to students who participate in global health activities and contribute to global health field (183). Aside from *Marginalized Community Selective*, at this time there are no formal electives available for medical residents; however residents are encouraged to contact their respective programs.

University of Ottawa Faculty of Medicine

University of Ottawa Office of Global Health activities include providing support to learners interested in global health, working towards building institutional partnerships, organizing pre-departure training and development of undergraduate global health curriculum (40). Undergraduate students are encouraged to participate in international electives and they are provided with the necessary support before and after the elective.

Furthermore, the Office supports *Action Global Health Network* (AGHN), a global health networking tool that acts as global health projects inventory and facilitates information exchange between Ottawa based faculties and healthcare organizations (185). This is an excellent resource for students, residents and professionals which contains information about relevant organizations, ongoing global health projects,

collaborations, training opportunities, events and news (185). Additionally, students formed *Medical Students International Health Interest Group* (MIHIG) that promotes global health, by organizing educational sessions and awareness campaigns (186).

An example of engagement opportunity at the postgraduate level is 12-month PGY-3 training in Global Health offered by the Department of Family Medicine to family medicine residents (187).

University of Toronto Dalla Lana School of Public Health

Global Health Office at the University of Toronto operates as a part of Dalla Lana School of Public Health (DLSPH) and is dedicated to advancing global health education, research and other initiatives (188). DLSPH offers a number of specialized courses focusing on health equity, migration, international health, women's' health, human rights and other global health topics. Additionally, *Global Health Education Initiative* is a 2-year program offered to postgraduate medical trainees from all disciplines who want to learn more about global health while meeting CanMEDS objectives (188). Moreover, departments of emergency medicine, family and community medicine, obstetrics and gynaecology enable trainees to join international projects in global health (188).

Global health electives can be costly; therefore Medical Alumni Association (MAA) offers *International Health Scholarship* to medical students who intend to participate in clinical electives in developing countries or other global health initiatives (188). Several groups advocating for global health are active at the University of

Toronto. An example of such group is *Health Equity Initiative* led by undergraduate medical students that promotes equity in medical curriculum (188). Overall, DLSPH website is an excellent source of information for students and individuals interested in global health.

McGill University Faculty of Medicine Global Health Programs

The Global Health Programs at McGill University is dedicated to establishing international partnerships with the emphasis on development and research, assisting students and faculty members in their efforts to improve health of disadvantaged populations, and training researchers and health care workers interested in global health (189)(190).

To show recognition for students' efforts, McGIll global health office organizes the *Student Global Health Night*, the annual event at which *Health Programs Photography Competition* winner and the *Faculty of Medicine's Chan Prize* winner are announced (189). *Faculty of Medicine's Chan Prize* is awarded to a student who participated in the international or multicultural elective and had the best project presentation. Students are actively involved in global health initiatives. Aside from participating in international activities such as pre-departure training, students also run a weekly *Health on Earth Radio Show* that covers global health topics (189). Another important event is the *McGill Global Health Programs Annual Conference* where students get to learn more about different aspect of global health from the leading experts (189).

McGill University students can learn about global health by taking specialized global health courses. *McGill Interprofessional Global Health Course* and *McGill Humanitarian Studies Initiative* are offered to graduate students and those in health professions, including medical residents and Faculty (189). Global Health Programs office promotes international experiences by maintaining resourceful website that provides a list of global health organizations, departments and initiatives at McGill University, in Canada and abroad (189).

Montréal Faculté de Médecine

Université de Montréal Faculté de Médecine does not offer a program in international health, however participation in international internships is encouraged (191). The University provides a list of organizations and faculty members in departments of obstetrics, family medicine and emergency medicine that may facilitate potential international experience (191).

Université de Sherbrooke Faculté de Médecine et des sciences de la santé

Université de Sherbrooke Faculté de Médecine et des sciences de la santé offers a course in *International Health* organized by family physicians and other individuals with experience in global health (192). Target population are medical students, resident, practicing physicians, nurses and other healthcare professionals who intend to practice in developing countries. The course covers infectious diseases, humanitarian crises

management, ethics, medical practice in cross-cultural setting and other topics of interest for competent healthcare practice in developing countries. The Faculty also offers an opportunity for international practice in Mali and the *International Health* course is one of the prerequisites (192).

University of Saskatchewan College of Medicine

Global Health Committee is the central group that coordinates and supports global health initiatives at the University of Saskatchewan College Of Medicine (193).

Global Health Certificate Program has been approved by the University Council in May 2011, and it will be offered as of September 2011 to undergraduate medical students (193). This is the first such program offered at a Canadian University. The purpose of the program is to enable students to competently practice medicine when working with disadvantages populations in low resource environments. The program consists of language training, two global health courses and three different practical experiences (rural Africa, northern Saskatchewan and inner city). *Global Health Travel Awards Program* is another way of encouraging medical trainees and faculty. Several awards are given to residents and faculty that engage in global health activities for their efforts in making a positive change (193).

The University of Saskatchewan College of Medicine requests from students intending to participate in an international experience to complete the on-line pre-departure course and to participate in a pre-departure training group session facilitated

by a faculty member (193). Upon their return students are asked to participate in a de-briefing session and to present their international experience during a *Global Health Series* or other forums. The *Global Health Series* is an opportunity for students and faculty to present their engagement in global health and the presentations are organized by the *Global Health Committee* and a student group *Health Everywhere* (193). The *Global Health Series* collaborates with the University's International Research Office, and together they organize a *Global Health Research Forum*, a one-day event for researchers to exchange information about their involvement in global health (193).

University of Saskatchewan participates in the *Training for Health Renewal Program* in Mozambique. This is a five-year program funded by $8 million grant from Canadian International Development Agency (CIDA) and coordinated by the University of Saskatchewan and the Ministry of Health in Mozambique (194). The aim is to improve community development in Mozambique by strengthening health systems and capacity-building with focus on major diseases such as HIV/AIDS and malaria. Students are encouraged to to participate. The College of Medicine also maintains an online Database on Global Health Involvement (193).

Appendix B The questionnaire developed and used in the study

uOttawa

L'Université canadienne
Canada's university

Global Health Competency Skills:

A Self-assessment For Medical Students

Dear colleagues,

The International Federation of Medical Students' Associations' (IFMSA) mission is to promote cultural understanding and co-operation among medical students and all health professionals through the facilitation of international student exchanges.

To better prepare medical students for future IFMSA international exchanges, we need your help!

In partnership with the University of Ottawa's Centre for Global Health, we would like to ask you to complete the following **global health questionnaire for medical students** for a research study. IFMSA will be provided with the study results that are to be used to guide the development of preparation sessions prior to departure to an international clinical rotation.
This questionnaire should take you 5-10 minutes to complete. All the information that you enter will be anonymous and it will be kept confidential. Your participation is voluntary. Completion of the questionnaire will be considered as your implicit consent to participate in this study. The results of this study will be disseminated during scientific meetings and through peer-reviewed publications.

This questionnaire is part of a graduate student thesis at the University of Ottawa. This study has been approved by the Ottawa Hospital Research Ethics Board. All research related records will be kept for 15 years after the termination of the study. The Ottawa Hospital Research Ethics Board and the Ottawa Hospital Research Institute may review your relevant study records for audit purposes. If you have any questions about your rights as research participants, you may contact the Chairman of the Ottawa Hospital Research Ethics Board at (613) 798-5555, extension 14902. Ethics approval was issued on July 28,2010.

Thank you for your time!

An international clinical experience refers to clinical exposure, where a medical student practices medicine in a country other than the one they are studying in. It can be part of their medical curricula, or done at the student's own initiative. Sometimes it is referred to as an **international clinical or a professional exchange, elective, or rotation**.

PART A. Where applicable, please indicate your answer with a checkmark ☑

1. In what year were you born? 1 9 _ _

2. What is your gender?
- ❑ Female
- ❑ Male

3. In which country do you study medicine?

(Please specify) _____

4. How many years of medical school have you completed? (*Please select **only ONE** answer*)

- ❑ 1st year
- ❑ 2nd year
- ❑ 3rd year
- ❑ 4th year
- ❑ 5th year
- ❑ 6th year
- ❑ 7th year
- ❑ Other _____

5. How many years of clinical rotations have you had as a medical student? (*Please select **only ONE** answer*)

- ❑ 1 year
- ❑ 2 years
- ❑ 3 years or more
- (I didn't start clinical rotations.

6. When you work in a medical office, in how many languages are you able to effectively communicate with patients?
(Please select only ONE answer)

- ❑ 1 language
- ❑ 2 languages
- ❑ 3 languages
- ❑ 4 or more languages

7. During your medical studies, have you participated in clinical rotation(s) outside the country where you study?

- ❑ Yes
- ❑ No

8. If you did NOT complete an international clinical exchange, elective or rotation for medical students, please indicate the reason that best applies to you: (Please select only ONE answer)

- ❑ Was not part of my personal/career objectives
- ❑ Financial reasons
- ❑ Lack of opportunities
- ❑ Visa/administrative reasons
- ❑ Language barrier
- ❑ Other (please specify) _____

If you do not have international clinical experience, your survey is complete. Thank you for your participation!

If you had international clinical experience as a medical student (such as an international clinical exchange, elective or rotation)**, please complete the following questions in PART B and PART C.**

PART B. *Please indicate only ONE answer with a checkmark ☑*

1. How many international clinical exchanges, electives or rotations have you completed?

- ❑ One
- ❑ Two
- ❑ Three or more exchanges, electives or rotations

2. In total, how much time did you spend on an international clinical exchange(s), elective(s) and/or rotation(s)?

- ❑ Less than 1 month
- ❑ 1 month to 2 months
- ❑ More than 2 months, but less than 3 months
- ❑ 3 months or more

3. In which country (countries) have you completed your international clinical exchange(s), elective(s) or rotation(s)?

_____

4. What is the most important reason that you decided to go on an international clinical exchange(s), elective(s) or rotation(s)?
*(Please select **only ONE** answer)*

- ❑ To travel
- ❑ To improve my language skills
- ❑ To experience medical practice in a different cultural environment
- ❑ To fulfill the requirements of my medical school curriculum
- ❑ To look for future employment opportunities
- ❑ To try to arrange residency training after I graduate from medical school
- ❑ To try to build a partnership between my medical school and the clinical unit where I was placed as an exchange student
- ❑ To become more independent
- ❑ Other (Please specify) _____

5. When I was growing up, the socioeconomic status of my family in comparison to other people was:

- ❑ Better than most people
- ❑ The same as most people
- ❑ Worse than most people

PART C. GLOBAL HEALTH SKILLS SELF-ASSESSMENT **WORK WITH PATIENTS WITH DIFFERENT LINGUISTIC, EDUCATIONAL, SOCIOECONOMIC, AND CULTURAL BACKGROUNDS** Please indicate your level of agreement with following statements **BEFORE and AFTER the international clinical experience for medical students**.	**BEFORE international clinical exchange, elective or rotation**						**AFTER international clinical exchange, elective or rotation**					
	Strongly disagree (1)	Disagree (2)	Neutral (3)	Agree (4)	Strongly agree (5)	Not applicable	Strongly disagree (1)	Disagree (2)	Neutral (3)	Agree (4)	Strongly agree (5)	Not applicable
As a communicator												
1. I was comfortable building open and trusting relationships with my patients with different backgrounds.	1	2	3	4	5	❑	1	2	3	4	5	❑
2. I found it challenging to communicate effectively with my patients with different backgrounds.	1	2	3	4	5	❑	1	2	3	4	5	❑
3. Listening actively to my patients' concerns was challenging.	1	2	3	4	5	❑	1	2	3	4	5	❑
4. Expressing my ideas and concerns clearly was challenging.	1	2	3	4	5	❑	1	2	3	4	5	❑
As a collaborator												
5. I was uncomfortable consulting with other health care professionals to address issues of my patients with different backgrounds.	1	2	3	4	5	❑	1	2	3	4	5	❑
6. Addressing team disagreements related to care for patients with different backgrounds was challenging.	1	2	3	4	5	❑	1	2	3	4	5	❑
7. I was comfortable building partnerships with medical and other professionals to benefit my patients with different backgrounds.	1	2	3	4	5	❑	1	2	3	4	5	❑
As a medical professional												
8. It was challenging to provide medical care to my patients with different backgrounds.	1	2	3	4	5	❑	1	2	3	4	5	❑
9. I was able to understand perspectives of my patients with different backgrounds.	1	2	3	4	5	❑	1	2	3	4	5	❑
10. I was sometimes unable to provide the highest quality of care to my patients due to their educational, socioeconomic and cultural backgrounds.	1	2	3	4	5	❑	1	2	3	4	5	❑
11. It was challenging to discuss sensitive issues (e.g. alcohol, drugs, sexual issues) with my patients with different backgrounds.	1	2	3	4	5	❑	1	2	3	4	5	❑
As a health advocate (for patients)												
12. I found it challenging to identify needs of my patients with different backgrounds.	1	2	3	4	5	❑	1	2	3	4	5	❑
13. I was aware of the medical services available to my patients with different backgrounds.	1	2	3	4	5	❑	1	2	3	4	5	❑
As a manager (eg. time manager)												
14.I was effective in completing my responsibilities in the medical clinic when working with my patients with different backgrounds.	1	2	3	4	5	❑	1	2	3	4	5	❑
15. Helping my patients with different backgrounds to set realistic goals for their health was challenging within available time.	1	2	3	4	5	❑	1	2	3	4	5	❑
16. I knew how to use the expertise of nurses and other health professionals when working with my patients with different backgrounds.	1	2	3	4	5	❑	1	2	3	4	5	❑
As a scholar												
17. I knew how to access resources to keep up to date with global health issues.	1	2	3	4	5	❑	1	2	3	4	5	❑
18. I actively participated in global health activities.	1	2	3	4	5	❑	1	2	3	4	5	❑

THANK YOU FOR COMPLETING THE SURVEY! We would appreciate your suggestions on how to improve global health skills among medical students prior to their international clinical experience.

_____

Appendix C Ottawa Hospital Ethics Research Board Ethics Approval for the study

Ottawa Hospital Research Ethics Boards / Conseils d'ethique en recherches

July 28, 2010

Dear Dr.

Re: Protocol # **Global Health Competency Skills: A Self-Assessment for Medical Students**

Protocol approval valid until - July 27, 2011

Thank you for your letter dated July 15, 2010. I am pleased to inform you that this protocol underwent expedited review by the Ottawa Hospital Research Ethics Board (OHREB) and is approved. No changes, amendments or addenda may be made to the protocol or the consent form without the OHREB's review and approval.

Approval is for the following:
– Protocol dated July 9, 2010
- English Information sheet received July 27, 2010
– English Global Health Questionnaire for Medical Students received July 27, 2010

The validation date should be indicated on the bottom of all consent forms and information sheets (see copy attached). If the study is to continue beyond the expiry date noted above, a Renewal Form should be submitted to the OHREB approximately six weeks prior to the current expiry date. If the study has been completed by this date, a Termination Report should be submitted.

The Ottawa Hospital Research Ethics Board is constituted in accordance with, and operates in compliance with the requirements of the Tri-Council Policy Statement: Ethical Conduct for Research Involving Humans; Health Canada Good Clinical Practice: Consolidated Guideline; Part C Division 5 of the Food and Drug Regulations of Health Canada; and the provisions of the Ontario Health Information Protection Act 2004 and its applicable Regulations.

Yours sincerely,

Ottawa Hospital Research Ethics Board

Note: Personal information has been removed from this document.

Appendix D The list of countries in which study participants who completed the questionnaire studied medicine

Gross National Income (GNI) group as per World Bank (141)	**Country of medical studies**	**GNI Atlas Method (current US$) for the year 2009*** **	**The number of study participants**	**Percentage of study participants from the specific country (%)**
HIGH INCOME COUNTRIES → GNI ≥$12,276* (174 participants = 63.0%)	Australia	$43,770	10	3.5
	Austria	$46,450	5	1.8
	Bahrain**	$25,420	8	2.8
	Canada	$41,980	15	5.3
	Croatia	$13,770	5	1.8
	Czech Republic	$17,310	5	1.8
	Denmark	$59,060	4	1.4
	Estonia	$14,060	2	0.7
	Finland	$45,940	4	1.4
	France	$42,620	7	2.5
	Germany	$42,450	10	3.5
	Greece	$29,040	4	1.4
	Hong Kong SAR, China	$31,570	1	0.4
	Hungary	$12,980	2	0.7
	Israel	$25,790	4	1.4
	Italy	$35,110	5	1.8
	Japan	$38,080	9	3.2
	Kuwait**	$43,930	1	0.4
	Latvia	$12,390	1	0.4
	Malta	$18,360	9	3.2
	Netherlands	$48,460	9	3.2
	Norway	$84,640	4	1.4
	Oman**	$17,890	1	0.4
	Portugal	$21,910	4	1.4
	Republic of Korea	$19,830	4	1.4
	Saudi Arabia	$17,210	9	3.2
	Slovak Republic	$16,130	3	1.1
	Slovenia	$23,520	3	1.1
	Spain	$32,120	12	4.2
	Swiss	$65,430	8	2.8
	United Kingdom	$41,370	2	0.7
	United States	$46,360	4	1.4

UPPER MIDDLE INCOME COUNTRIES → GNI $3,976 - $12,275* (72 participant = 25.0%)	Bosnia and Herzegovina	$4,700	1	0.4
	Brazil	$8,070	3	1.1
	Bulgaria	$6,060	1	0.4
	Chile	$9,470	5	1.8
	Ecuador	$3,970	5	1.4
	Grenada	$5,580	2	0.7
	Iran	$4,530	1	0.4
	Jamaica	$4,590	3	1.1
	Lebanon	$8,060	7	2.5
	Libya	$12,020	5	1.4
	Lithuania	$11,410	3	1.1
	Mexico	$8,960	4	1.4
	Panama	$6,570	5	1.8
	Peru	$4,200	7	2.5
	Poland	$12,260	5	1.8
	Romania	$8,330	11	3.9
	Russia	$9,340	1	0.4
	Serbia	$6,000	1	0.4
	South Africa	$5,760	1	0.4
	Turkey	$8,720	1	0.4
LOWER MIDDLE INCOME COUNTRIES → GNI $1,006 - $3,975* (27 participants = 11.2%)	Bolivia	$1,630	1	0.4
	China	$3,650	4	1.4
	Egypt	$2,070	1	0.4
	El Salvador	$3,370	7	2.5
	Indonesia	$2,050	10	3.5
	Jordan	$3,980	1	0.4
	Nicaragua	$1,000	1	0.4
	Sudan	$1,220	1	0.4
	Tunisia	$3,720	1	0.4
LOW INCOME COUNTRIES → GNI ≤ $1,005* (2 participants = 0.7%)	Ghana	$1,190	1	0.4
	Rwanda	$490	1	0.4
	*Taiwan****	-	*7*	*2.5*
Missing			*4*	*1.4*

* Gross National Income (GNI) Atlas Method (current US$)

** Kuwait - data from 2007; Bahrain, Oman and Belize - data form 2008;

***GNI data unavailable for Taiwan (Republic of China)

**** The World Bank data accessed in June 2011 (141)