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REVIEW

International short-term medical missions: a systematic review of recommended practices

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Abstract
Objectives To identify practices for conducting international short-term medical missions (STMMs) recommended in the literature and examine how these link STMMs to recipient countries' existing health systems.
Methods Systematic review of PubMed-indexed articles on STMMs and their bibliographies using preferred reporting items for systematic reviews and meta-analyses guidelines. Recommendations were organized using the World Health Organization Health Systems Framework.
Results In 92 publications, 67 % offered at least one recommendation that would link STMMs to the recipient country's health system. Among these recommendations, most focused on service delivery and few on health financing and governance. There is a lack of consensus around a proper standard of care, patient selection, and trip duration.
Conclusions Comprehensive global standards are needed for STMM work to ensure that services are beneficial both to patients and to the broader healthcare systems of recipient countries. By providing an overview of the current recommendations and important gaps where practice recommendations are needed, this study can provide relevant input into the development of global standards for STMMs.

Keywords Medical missions · Global health · Standards

Introduction

Each year, everyday citizens donate their time and resources to participate in the international short-term medical missions (STMMs), a form of grassroots aid in which healthcare professionals from high-income countries (HICs) travel to low- or middle-income countries (LMICs) to deliver direct patient care for up to 2 years. A growing number of medical professionals, students, and volunteers are organizing into visiting medical teams (VMTs) and participating in this niche healthcare delivery model to deliver an array of services ranging from basic medical care and dentistry to pharmaceutical services and surgery (Martiniuk et al. 2012; Sykes 2014).

What is known about STMMs comes primarily from three systematic reviews. Martiniuk et al. (2012) reviewed 230 articles on STMMs published between 1985 and 2010 and found that 78 % of pieces were descriptive and lacked a theoretical or conceptual analysis of the care. Sykes's (2014) review focused on 67 publications with empirical results and found that 95 % lacked any significant data collection. He calls for collaborative priority setting around data collection and outcome assessment to understand STMMs' impact. Finally, Caldron et al. (2015) examined 41 empirical studies and found a dearth of literature on social, economic, and diplomatic aspects of STMMs.

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Five other reviews—three systematic and two non-systematic—focus on specific types of STMMs. Nolte et al. (2016) systematically reviewed 17 surgical mission publications for their adherence to World Health Organization (WHO) Choosing Interventions that are Cost-Effective (WHO-CHOICE). Non-adherence to these standards hindered their ability to compare the missions, leaving their economic benefit unclear. Through systematic review of 104 global surgery publications, Shrime et al. (2015) compared three charitable platforms for global surgery—STMMs, self-contained surgical platforms (e.g., Mercy Ships), and specialty surgical hospitals run by NGOs—and concluded that the latter two provide more effective and more cost-effective care, except when no other care delivery option is available. Through systematic review of 31 publications, Ekenze et al. (2014) identified four types of international partnerships for child surgery in Sub-Saharan Africa—one being STMMs—and found that results of these efforts are variable, with limited sustainability and self-reliance of host nations. Grimes et al. (2013) reviewed 18 surgical mission publications and proposed a series of guidelines for surgeons interested in establishing projects in low-income countries. The guidelines are narrow in scope, focusing primarily on how to set up and carry out an STMM, and less on broader aspects of STMMs, such as ethics and legality. Finally, Dainton et al. (2016) reviewed eight publications specific to primary care missions in Latin America and the Caribbean and found a dearth of evidence-based clinical guidelines.

Notably, none of these reviews propose comprehensive, global standards for STMM work. To date, the most notable attempt to create STMM standards comes from the Working Group on Ethics Guidelines for Global Health Training (WEIGHT) (Crump and Sugarman 2010). These guidelines, however, are geared towards trainees in global health, propose standards for host and sender institutions, trainees, and sponsors, and emphasize the ethical issues when sending trainees from HICs to LMICs. Since STMMs are conducted for multiple purposes apart from training in general, there is a need for broader, global standards that would not only increase accountability for all types of participants, but also open opportunities to develop an evidence base to measure the impact of STMMs. No review has examined practice recommendations for STMMs or focused on how STMMs interface with recipient countries' health systems. In the absence of any central registry that documents actual STMM practices, we refer to the published literature to see what practices are promoted.

The objective of this study was (1) to identify recommended practices for conducting STMMs and (2) to examine how these recommended practices link STMMs to the recipient country's health system. This work is a first step in fostering discussion around the current practices, gaps in guidelines, and how health systems of recipient countries may be impacted by STMMs.

Methods

Eligibility criteria and literature search

We conducted this review using Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines (Liberati et al. 2009). This study was part of an ongoing literature review to examine the nature and scope of STMM publications since 2010; thus, we limited our search to articles with a publication date or advanced online publication date between January 1, 2010 and June 1, 2016 and their bibliographies. We employed Martiniuk et al.'s (2012) classification scheme, which divides articles on STMMs into three categories: descriptive, critical appraisal, and theoretical/conceptual. Unlike descriptive and critical appraisal pieces, theoretical articles do not describe or evaluate a specific mission, but evaluate the concept of STMMs as a whole. Since the objective of our review was to identify recommended practices for conducting STMMs, we included all theoretical articles that offered at least one tangible recommended practice. All other publications were excluded.

We also excluded articles that focused primarily on military or disaster medicine, medical school curriculum reform, the history of medical missions, and case reports. We excluded pieces that profiled a specific person or organization(s), reported on surveys to assess prospective participants' interest, and articles otherwise categorized as descriptive or critical appraisal pieces, as described above. Articles not written in English, German, or Spanish—the languages in which the authors are fluent—and pieces to which the authors did not have access were also excluded.

Using synonyms for STMM identified by Sykes (2014), we built a comprehensive search term (Online Resource 1) to capture relevant publications via PubMed. We then reviewed the titles, abstracts, and/or full texts of each article, with ineligible pieces discarded after each stage. Finally, we searched the bibliographies of each eligible article by hand and reviewed them for inclusion using the same process.

Data extraction and analysis

Currently, there are no existing extraction tools for identifying recommended practices; however, a recent survey of STMM volunteers conducted by the Catholic Health Association USA (CHAUSA 2014) includes the most comprehensive description of STMM practices that we could find. Using these survey findings, we developed a novel extraction tool (Table 1). The authors pilot tested

Table 1 Data extraction tool used to collect details from each included article

Item/question	Question type	Answer choices
Article title	Free-text	–
Author(s)	Free-text	–
Journal	Free-text	–
Year of publication	Free-text	–
Does the article recommend any links to the healthcare system?	Radio	Yes
		No
If yes, what links to the healthcare system are explicitly recommended? (select all that apply)	Checkbox	Registration of VMT with government/MOH
		Partner with a local medical organization (e.g., hospital, medical school)
		Obtain ethics or IRB approval from a local organization (e.g., hospital, university)
		Include local healthcare providers
		Refer patients to local healthcare system when needed
		Use local healthcare services (e.g., for imaging studies, labs)
		Use local healthcare facility
		Acquire patients' existing health records
		Procure medical supplies for the STMM locally
		Leave behind documentation of the medical services the patient receives
		Other
If "other" selected, describe	Free-text	–
Does the article recommend collecting data on STMM outcomes/results?	Radio	Yes
		No
If yes, what does it recommend?	Free-text	–
What other recommendations (not specific to linking to the health system) are mentioned? (select all that apply)	Checkbox	Partner with a local non-medical organization (e.g., an NGO)
		Determine what supplies/equipment to bring by talking with someone on the ground
		Research the country's culture and health needs
		Provide VMT members with pre-departure training (e.g., about the country's health challenges, socioeconomic history)
		Research the local laws (e.g., about importing medications)
		Use interpreters
		Determine the STMM's goal (e.g., what services will be provided, if sample medications will be used)
		Develop an ethical framework (e.g., rules on patient selection or what students are allowed to do)
		Consider feasibility of continuity of care (e.g., possibility for follow-up care, refilling prescriptions)
		Broad recommendation to respect local culture/be culturally sensitive
		Recommendations about what to bring (e.g., clothes, supplies)
		Recommendations related to vaccines and personal safety
		Recommendations related to in-country travel
		Other
If "other" selected, describe	Free-text	–

VMT visiting medical team, *MOH* ministry of health, *IRB* institutional review board, *NGO* non-governmental organization

this tool on 10 % of the articles selected at random and revised it through comparison of results and group consensus. Extraction was then repeated with another 10 % of articles to ensure common understanding of how to apply the tool. Frequency counts were obtained using SAS Version 9.3 (SAS Institute Inc., Cary, NC). Free-text responses were analyzed using content analysis (Hsieh and Shannon 2005). To examine how recommended practices link STMMs to the local health system, we organized them using the six building blocks of the WHO's Health Systems Framework (World Health Organization 2007).

Results

Study selection

A total of 92 articles were identified for inclusion in this review (Fig. 1): 63 from our PubMed search and 29 from bibliographic review (see Online Resources 2–4 for the list of included articles and exclusion reasons). Of 92 articles, 62 (67 %) recommend at least one practice that would link the VMT to the local health system. All recommendations are summarized in Table 2, with sample quotes in Online Resource 5.

Service delivery

Patient safety and quality of care

The majority of recommended practices relate to patient safety and quality of care. "Standard of care" is mentioned in 29 % of articles (27/92); yet, few pieces offer clear recommendations on this topic. A few authors recommend that VMTs maintain the same standard of care as they do in their home institutions, but the other pieces simply state that an "acceptable" or "appropriate" standard of care should be followed, without offering any further detail. Some authors state that the standard of care is context-dependent and encourage VMTs to follow "the local standard of care", even when this may fall below the standard VMTs use at home. For example, if resources are limited, these authors condone the use of outdated medications or reusing equipment, especially if this is common practice among their hosts (Fisher et al. 2002; Howe et al. 2013; Woods and Kiely 2000). Rose (2011) problematizes the concept of standard of care by questioning its applicability in STMM settings, and several others call for the establishment of minimum standards (Asgary and Junck 2013; Chapin and Doocy 2010; Kingham et al. 2011; Wall 2011).

About one-fifth (23 %, 21/92) of articles recommend that VMT members practice within their skill set and provide appropriate supervision of trainees. Seventeen percent (16/92) of articles also recommend that the VMT develop an ethical framework. Eleven percent of articles (10/92) offer recommendations on patient selection; however, the proposed criteria differ, with some authors emphasizing patient selection be "objective" or "fair", "prospective", "conservative", or "evidence-based". Articles lack details on how to operationalize the process of patient selection.

Although many pieces mention language barriers between VMTs and patients, only ten (11 %) recommend using interpreters. Less common recommendations related to patient safety—mentioned in 9 % or less of articles—include establishing emergency plans, limiting the number of patients the VMT sees or the hours they work, and operating riskier cases first to maximize post-operative follow-up time.

Patient autonomy

Obtaining informed consent is recommended in 17 % (16/92) of articles. Authors point out several challenges to acquiring informed consent, such as time constraints, and warn against coercion. Thirteen authors (14 %) cite cultural and language differences and varying levels of heath literacy as barriers to informed consent.

Continuity of care

About a third of articles (29 %, 27/92) recommend that VMTs consider the feasibility of follow-up care after their departure, with several acknowledging this may require hiring local doctors to help. STMMs sometimes encounter patients who require care that is beyond what the VMT can offer; however, only six publications (7 %) recommend that VMTs refer such patients to the local healthcare system.

Minimizing impact on regular service delivery

Eleven percent of articles (10/92) recommend VMTs take measures to avoid disrupting the flow of regular service delivery at their host institutions. Disruptions include creating burdens for their hosts—e.g., a backlog of cases, medical waste—and displacing or disenfranchising local healthcare workers.

Integration with local health services and sustainability

Seven articles (8 %) recommend that VMTs use local health services when possible for tests, such as imaging studies. Ten articles (11 %) offer broad advice for VMTs to "integrate" or "coordinate" their care with existing health

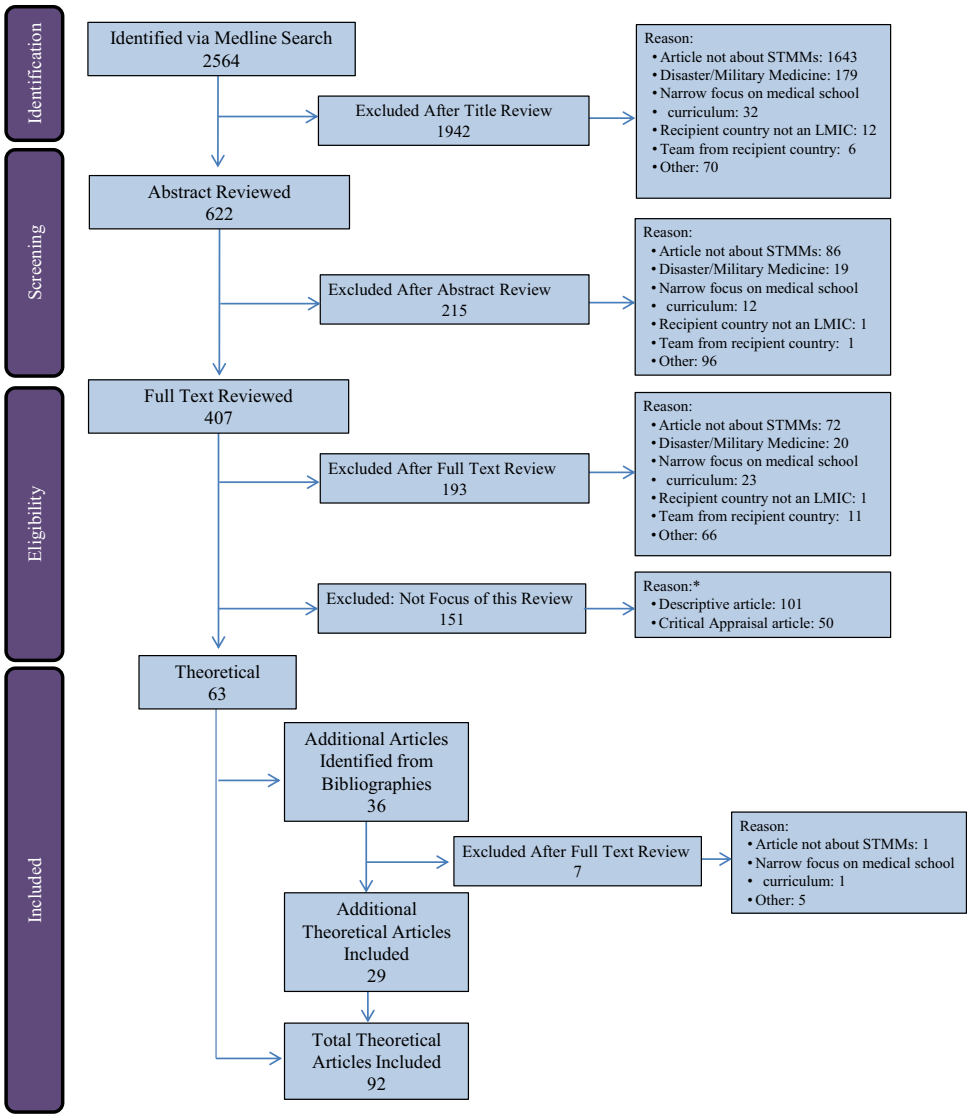

Fig. 1 Study flow diagram showing that the abstracts and/or full texts of 2564 articles identified via PubMed search (*top box*) were reviewed, with *boxes on the right* detailing reasons for exclusion. A total of 92 articles were included in the review (*bottom box*). Abbreviations: *STMM* short-term medical mission, *LMIC* low-or middle-income country. *See Martiniuk et al. (2012)

services, workforce, and/or infrastructure, but only one piece (Patel et al. 2012) offers a comprehensive explanation of what such integration would look like by proposing a longitudinal approach that includes long-term outcomes monitoring, bilateral exchange, and a self-sustained revenue stream.

Although 32 % (29/92) of articles cite "sustainability" as an important aim for STMMs, none explicitly define "sustainability". Many state that a "long-term" commitment is necessary, but the literature does not offer any concrete recommendations regarding how long VMTs should work in a community, for instance. On the one hand, the authors advise against doing one-time trips and encourage VMTs to return to the same location as regularly as possible; at the same time, many authors warn against creating "dependency".

Human resources

The single most common recommendation—proposed in 54 % of articles (50/92)—advises VMTs to include local healthcare providers in the STMM, primarily in the context of continuing education: "…[A] volunteer's role is primarily that of a teacher, rather than the primary provider of service to patients" (Birman and Kolkin 2013, p.803). Viewing STMMs as a mechanism for skill and knowledge transfer, these authors argue that including a teaching component will help communities move away from needing VMTs. Several authors encourage the inclusion of local providers because of their expert knowledge of the community and its health needs. A handful of articles emphasize that the teaching should be bidirectional, with both the host and visiting teams learning from one another.

Table 2 Recommended practices for short-term medical missions and their prevalence in 92 theoretical articles

WHO health system building block	Subcategory	Recommendation	*n* (%)
Service delivery	Patient safety and quality of care	Uphold the standard of care	27 (29 %)
		Practice within your skill set and provide appropriate supervision of trainees	21 (23 %)
		Develop an ethical framework	16 (17 %)
		Conduct patient selection in a particular way	10 (11 %)
		Use interpreters	10 (11 %)
		Establish emergency plans, limit the number of patients the VMT sees or hours they work, or operate on patients in a particular order	8 (9 %)
	Patient autonomy	Get informed consent from patients	16 (17 %)
		Consider cultural and/or language barriers to informed consent	13 (14 %)
	Continuity of care	Consider the feasibility of follow-up care after the VMT's departure	27 (29 %)
		Send patients requiring additional care to the local healthcare system	6 (7 %)
	Minimizing impact on regular service delivery	Avoid disrupting the regular flow of service delivery	10 (11 %)
	Integration with local health services and sustainability	Consider the sustainability of STMM work	29 (32 %)
		Integrate/coordinate STMM care with existing health services	10 (11 %)
		Use local health services when possible (e.g. for imaging studies)	7 (8 %)
Human resources	–	Include local healthcare providers in the STMM	50 (54 %)
Health information	–	Leave behind documentation of the care the patient received	6 (7 %)
		Acquire patients' existing health records, if possible	1 (1 %)
Medical products and technology	–	Donate supplies and equipment in a particular way	15 (16 %)
		Consider care continuity needs related to medicines and technologies	9 (10 %)
		Distribute/dispose of medications in a particular way	4 (4 %)
Health financing	–	Consider patient costs	5 (5 %)
		Do not burden host institutions with costs	5 (5 %)
Leadership and governance	Collaborative partnerships	Engage in collaborative goal-setting with in-country stakeholders	19 (21 %)
	Obtaining legal authorization	Research local laws on practicing medicine and/or register with appropriate health authorities	14 (15 %)
	Other accountability measures	Assess patient outcomes	22 (24 %)
		Recommends a specific accountability measure for STMMs	5 (5 %)

Table 2 continued

WHO health system building block	Subcategory	Recommendation	*n* (%)
Other recommendations	Pre-mission planning	Consider VMT members' personal safety, immunizations, passport and visa requirements, what to pack, and local transport options	23 (25 %)
		Select site based on certain criteria and/or conduct a pre-mission site visit/needs assessment	20 (22 %)
		Partner with an in-country organization, such as an NGO	16 (17 %)
	VMT characteristics	Research the destination country and/or undergo pre-departure training	37 (40 %)
		Respect local culture/deliver culturally sensitive care	28 (30 %)
		Select VMT members based on certain criteria	19 (21 %)

STMM short-term medical mission, *VMT* visiting medical team, *NGO* non-governmental organization

Health information

Few practice recommendations focus on health information. One only article (Taub et al. 2015) recommends that the VMT attempt to acquire patients' existing health records. Six authors (7 %) advise that VMTs leave behind documentation of the care the patient received. A couple of articles view health information management as a shared responsibility of the VMT and its host (Fisher et al. 2002; Schneider et al. 2011).

Medical products and technology

Sixteen percent (16 %, 15/92) of articles offer recommendations on donations of medical supplies and equipment, such as ensuring their shelf life, appropriateness, and availability of adequate storage facilities. Four articles (4 %) also offer advice on the distribution and disposal of medications.

One-tenth of articles (10 %, 9/92) urge VMTs to consider care continuity needs related to medicines and technologies. One pharmacist explains, "It is advisable to review the national formulary if the country you are visiting has one. This will assist in determining whether patients will be able to continue their therapy after your supply is exhausted and your team has departed" (Brown and Ferrill 2012, p.756). Even if a medication is available locally, a handful of authors urge VMTs to consider if patients can afford the refills.

Health financing

Although the literature features much discussion about cost-effectiveness and/or expenses incurred by VMT members, few recommendations focus on costs to the recipient health system or patients. Five pieces (5 %) warn against burdening host institutions with costs. As for patient costs, five articles (5 %) mention of out-of-pocket expenses patients incur during STMMs. Four authors explicitly state whether patients should be charged for STMM services, and they offer contradictory views, with three stating that care should be free (Nugent et al. 2015; Schneider et al. 2011; Wall 2007), and another stating, "We should not provide free care if that decreases revenue for local providers" (Zink 2012, p.28).

Leadership and governance

Partnerships

About one-fifth (21 %, 19/92) of articles recommend that VMTs plan the STMM with in-country stakeholders, commonly identified as the host institutions but sometimes also as local political figures, civic sponsors, and patients. Collaborative goal-setting is viewed as a way to increase community ownership and ensure better sustainability. A couple of articles also recommend that VMTs establish formalized agreements with their in-country partners to specify expectations, roles, and responsibilities (Boston and Horlbeck 2015; Melby et al. 2015).

Obtaining legal authorization

About 15 % (14/92) of articles recommend that VMTs research the local laws on practicing medicine and/or register with the appropriate authorities, identified by some as a governmental agency or, for projects involving

research, an in-country Institutional Review Board (IRB). VMT members are also urged to verify their malpractice insurance coverage and/or get permission from their home institutions.

Other accountability measures

A common critique of STMMs widely acknowledged in the literature is the lack of accountability for patient outcomes. Despite an acute awareness of this critique, only five articles (5 %) recommend specific accountability measures for STMMs. Their recommendations include ethical review of STMM activities involving the local community (Decamp 2011), adverse event reporting systems (Brooke et al. 2015; Fisher et al. 2002), quality improvement committees (Schneider et al. 2011), and quality assurance programs (Fisher and Fisher 2014). Nearly a quarter (24 %, 22/92) of authors call for the assessment of STMM patient outcomes, but the majority of articles do not specify what information should be collected, who should be responsible for collecting and reviewing this information, and what actions should be taken if assessment reveals poor patient outcomes.

Other recommendations not related to health system linkage

Pre-mission planning

Many recommendations focus on how to organize an STMM. One-quarter (25 %, 23/92) of publications offer travel advice for VMTs about personal safety and immunizations, passport, and visa requirements, what to pack, and how to get around the country. Seventeen percent (16/92) of articles recommend that the VMT partner with an in-country organization, such as a local NGO, that can, for example, help secure a venue. Twenty-two percent of articles (20/92) propose criteria for site selection and/or recommend the VMT conduct a site visit.

VMT characteristics

One-fifth of articles (21 %, 19/92) propose criteria for selecting VMT members mostly centered on volunteers' medical credentials and experience, but also on their motives, moral character, and ability to work in a team. Two-fifths (40 %, 37/92) of articles recommend that VMT members research the destination country and/or undergo pre-departure training. A couple of articles recommend that, prior to departure, VMT members learn specific medical skills for low-resource settings, such as lumbar punctures or rudimentary chest tube water seals. A third (30 %, 28/92) of articles urge VMTs to "respect local culture" and/or deliver "culturally sensitive care".

Discussion

To our knowledge, this is the first systematic review to identify recommended practices for STMMs. We found that although a fair number of publications recommend practices that would link the STMM to the recipient country's health system, the majority of recommendations focus primarily on one domain—service delivery—whereas very few focus on financing and governance. In the following sections, we examine these recommended links, identify gaps in guidelines, and discuss the implications our findings have for international public health.

Service delivery

Given that STMMs have been widely criticized for their risks to patients (Bezruchka 2000; Bishop and Litch 2000; Deem 2011; Dupuis 2004), it is not surprising that the majority of recommended practices involve patient safety and quality of care. Two major areas which lack consensus, however, are standard of care and patient selection. Establishing a process to determine a minimum standard of care for STMMs and standard patient selection criteria would help combat the notion that "any care is better than no care" and assist VMTs with difficult treatment decisions. Increased collaboration with local health institutions could be an important way to define standards of care and improve patient selection. VMTs and local health professionals should discuss the feasibility of adhering to international clinical guidelines for the type of care to be delivered and build consensus around the topic of acceptable deviations from these standards (e.g., allowing the one-time re-use of surgical instruments that have been sterilized using a particular technique) (Dainton et al. 2016). Pre-existing guidelines, such as Operation Smile's Global Standards of Care for cleft lip and palate surgery (Operation Smile 2015) and the WHO's Surgical Safety Checklist (World Health Organization 2009), could also be considered. Although focused on disaster response, the Sphere Handbook (The Sphere Project 2011) could also be adapted to STMMs.

Only three articles in our review recommend that the VMT connect patients with the local health system when they require care beyond what the STMM can offer. Anecdotal evidence from other publications indicates that these patients are usually sent home (Chary 2015; Hunt et al. 2012; Langowski and Iltis 2011; Montgomery 1993; Rohloff and Chary 2015). The general lack of formal or informal referrals from STMMs to the local health system may be due, in part, to an assumption that VMTs are patients' only hope for accessing care. Often, however, STMMs operate within a patchwork of private, public, and philanthropic health resources to which patients have

varying degrees of access (Chary 2015; Whyte et al. 2014). Given that VMTs are sometimes the first to diagnose a patient, they are poised to have a substantial impact if they can promptly connect the patient with the needed care. The ability to make successful connections, however, requires an awareness of locally available resources. Guidelines for creating institutional partnerships with the existing health system so that VMTs know about available resources—and for determining how to fund such referrals—would obviate the need for VMTs to turn patients away outright and help patients receive more appropriate, timely care.

Finally, patients and VMTs would benefit from additional guidelines specifying how informed consent should be obtained during STMMs, where time is limited and VMTs are often not fluent in the patients' language or cultural norms. Given the parallels between STMMs and international medical research, a good starting point for creating guidelines is the Council for International Organisations of Medical Sciences (CIOMS)'s International Ethical Guidelines for Biomedical Research Involving Human Subjects (Council for International Organisations of Medical Sciences 2002). Such guidelines for STMMs could addresses, for example, the use of trained medical interpreters, how much time patients should be given to make their decision, and who should be involved in the consent process.

Human resources

Most authors recommend that local providers be included in STMMs as students and frame the primary goal as knowledge and skill transfer, a unidirectional model that may not be appropriate for all settings. Bidirectional learning may result from more effective collaborative planning of STMMs. Collaboration with local providers would benefit patients as VMTs would have a better understanding of the broader health landscape and stronger networks of in-country colleagues to whom they could refer patients as needed. Local health providers could also monitor patient outcomes after the STMM ends.

Health information

The literature on STMMs offers little guidance on using pre-existing patient information. Although sometimes nonexistent or inaccessible (Chary 2015), this information, when available, could offer a more complete understanding of the patient's health, assist VMTs in their treatment decisions, and avoid unnecessary duplication of services or patient harm. Host country privacy laws could pose potential legal barriers to accessing such information. Further dialogue on this topic, particularly with host country health authorities, is needed.

It is also important for VMTs to document their work so that patients and future providers have a complete understanding of the treatment(s) received. Previous studies (Chary 2015; unpublished white paper by Brockington et al. 2013) have found that STMM patients frequently do not obtain any record of their STMM care, making it difficult for subsequent providers to decide proper treatment courses. In some cases, VMTs wrongly assume that the NGO is keeping track of the care provided and/or communicating clinically important information back to patients. Prior to the STMM, VMTs and their in-country partners should determine whose responsibility it will be to collect and maintain health records. For example, VMTs and their hosts may design a standard template and agree that the NGO will host this information on a secure, web-based application. For multi-stage treatments, VMTs should establish a protocol for ongoing communication about future care.

Medical products and technology

To build consensus around what supplies and equipment VMTs should bring and/or donate at the end of a mission, a good starting point could be the WHO's Guidelines on Medicine Donations (World Health Organization 2011). Matching medicines provided by the STMM with those on the institutional formularies or public sector procurement lists is an important consideration. Opinions are divided on how STMMs should handle cases where medicines not available in the country are required for follow-up care; more discussion is needed to guide appropriate management.

Health financing

Our review found a gap in guidelines around acceptable patient costs for STMM care. According to several studies, patients' efforts to obtain care from STMMs often come after a series of failed attempts to access care in the formal healthcare system—sometimes over many years—during which patients incur substantial, if not catastrophic, health-related expenses (unpublished white paper by Brockington et al. 2013; Chary 2015; Rohloff and Chary 2015). Even when STMM care is free, patients still incur costs for transport, lodging, food, missed days of work, follow-up care and medication re-fills (unpublished white paper by Garrett et al. 2011). Guidelines on whether to charge patients for STMM care and, if so, how to determine a fair cost to patients, are needed to safeguard patients against catastrophic expenditure. Transparency around the costs to be incurred by patients, contextualized by the patient's current health and financial situation, would offer a more complete picture of how the STMM stands to impact the patient's life. Similarly, given that STMM financing relies heavily on private philanthropy (Gutnik

et al. 2015; Ng-Kamstra et al. 2016), greater transparency around the investments made by all involved parties (e.g., the VMT, host institution, local ministry of health) could inform more accurate assessments of cost-effectiveness.

Leadership and governance

Since STMMs are conducted at the global level and primarily through non-state, civil society networks, the usual tools of governance—such as national legislation and law enforcement—are largely absent for STMM work. It is fairly easy for an individual to join an STMM, and there is little accountability for STMM activities (Dupuis 2004; Roche and Hall-Clifford 2015). Several authors offer anecdotal examples of non-medical personnel or medical trainees engaging in medical activities that they are not qualified to do in their home country (Berry 2014; Roberts 2006). In some countries, such as Guatemala and the Philippines, VMTs are supposed to receive legal authorization from the local government prior to the STMM (Berry 2014; Philippines Professional Regulation Commission 2012), but evidence of VMTs failing to comply with these laws has been reported (Chapin and Doocy 2010; Roche and Hall-Clifford 2015). Although we do not know the extent of this problem, our review found that few articles—only fourteen—recommend that VMTs obtain legal authorization to practice medicine in-country. No articles in our review discuss the potential legal ramifications for visiting providers if an unexpected outcome occurs and, alarmingly, no article discusses what recourses patients have if they experience an unexpected outcome. Recipient countries and VMTs must establish guidelines on who can participate in STMMs, what participants are allowed to do, how the work will be conducted and overseen, and how patients' rights will be protected.

Finally, aligning stakeholders to develop global standards for STMMs requires leadership. Currently, most VMTs work independently of one another, leading many to call for better collaboration. As a first step, understanding who is engaging in STMM work is crucial, and some efforts to this end are underway (Ng-Kamstra et al. 2015). The creation of a registry "whereby ministries of health and local organizations can request or advertise [for STMMs]" would further shift the STMM model from a push- to a pull-strategy (Ginwalla and Rickard 2015, p.290). To date, no publication has identified individuals or organizations who should lead the movement to build consensus around global standards for STMM work.

Limitations

Our study has some limitations. First, the lack of consistent terminology related to short-term global health work makes it challenging to identify STMM publications using PubMed searches. Because we searched only PubMed-indexed articles published between 2010 and 2016 and their bibliographies, some articles on this topic may have been missed. However, the purpose of this review was to provide an overview of recommended practices in recent peer-reviewed publications. Given the lack of national and international regulation of STMMs, PubMed-indexed literature is a relevant source to gather these recommended practices. A second limitation is that some articles discussed specific aspects of STMMs, such as ethics, and, therefore, only offered recommendations on that topic. Finally, a recommendation's absolute frequency is not necessarily related to its import. Still, the comparative frequencies of different recommendations offer an idea about the perceived importance that they have to the authors proposing them.

Conclusion

As STMMs continue to grow in volume, clear guidelines are needed to create global standards to ensure that the services delivered are beneficial not only to patients, but also more broadly to the healthcare systems of recipient countries. This review provides an overview of recommendations and identifies several areas of contradiction, including lack of consensus around the appropriate standard of care for STMMs and recommended duration of commitment. It also identifies a number of important gaps where practice recommendations are necessary, particularly in the realm of STMM oversight. The present study can provide relevant input into the development of global standard recommendations for STMM practices.

Compliance with ethical standards

Conflict of interest The authors did not receive any funding for this study and declare that they have no conflict of interest. This article does not contain any studies with human participants performed by any of the authors.

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