



**KIT** Royal  
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## Final report

ISUOG outreach capacity, impact & potential for  
scale-up

International Society of Ultrasound in Obstetrics and Gynecology (ISUOG)



# Assessment and potential for scale up of the International Society of Ultrasound in Obstetrics and Gynecology outreach program

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## Principal investigator(s)

Name: Irene de Vries, MD global health, MA medical anthropology/sociology

Position: Maternal newborn health advisor, KIT royal tropical institute

Name: Mahdi Abdelwahab, MBBCh, MSc International Health

Position: Global health education advisor, KIT royal tropical institute

## Quality assurance

Name: Barend Gerretsen, MD global health, MPH

Position: Public health and health system strengthening expert, KIT royal tropical institute

## Royal Tropical Institute (KIT)

Mauritskade 63

1092 AD Amsterdam

The Netherlands

## E-mail

i.d.vries@kit.nl

## Commissioning organization

International Society of Ultrasound in Obstetrics and Gynecology (ISUOG)

## Focal point at commissioning organization

Cate Kirkbride - Director of Communications and Engagement ISUOG

ckirkbride@isuog.org

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# Glossary and list of abbreviations

ANC	Antenatal care
ISUOG	International Society of Ultrasound in Obstetrics and Gynaecology
mHealth	mobile health
ObGyn	Obstetricians and Gynaecologists
ToC	Theory of Change
UHC	Universal Health Coverage
US	Ultrasound

## **5AQ's of Access**

Availability	A medical device is able to be purchased on the market. Also applies to functional medical devices that are physically available at health care facilities with competent staff to use them.
Affordability	Medical device is a cost-effective option for both the patient, the health care facility and health system.
Accessibility	Individuals are geographically within reach of health care facilities that house quality imaging services, do have the transport to go there and the services are physically accessible, also for people with disabilities.
Appropriateness	A medical device or imaging technology must be scientifically valid, address local need, and be utilized in a manner that a country can afford.
Acceptability	Refers to cultural beliefs and individuals' attitudes regarding the use of various medical devices and imaging modalities
Quality	Based on the national regulatory standards that are in place to assure safe and effective use of all health technologies

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# Abstract

## Background

Within ISUOG's ambition for more comprehensive programming, including global access to obstetric & gynaecology ultrasound and health systems strengthening, an assessment was conducted in 2021 that serves to understand ISUOG Outreach's current capacity & impact, align these with the global needs and inform its future strategy for sustainable impact.

## Methodology

ISUOG outreach vision –every woman should undergo a safe and patient-centred quality ultrasound (US) as part of their healthcare evaluation – and its current theory of change were taken as a starting point to define ISUOG's spheres of interest and use these as a theoretical framework for the assessment that focused on three case-study countries (Sudan, Rwanda, Oman). Four spheres of interest were defined: Training & education, Health system Strengthening, Global access, Advocacy.

A document review, self-administered online survey, key-informant interviews and global literature study were done between May – June 2021 to assess ISUOG's current capacity, impact and needs within the four spheres of interest.

## Findings

The outreach program seemed to be well established with clear evidence for its direct effects on knowledge and skills-building of the trainees, as deduced from pre-post test results and triangulated with the qualitative responses of this evaluation. Respondents in this evaluation expressed the positive impact of the program on the quality and practices of the trainees. Qualitative perspectives from professionals that had been involved in the program, together with evidence from the global literature, confirmed the need to further invest in sustainable quality-assured training and health systems alongside interventions that address access for patients. Considerations for future programs are provided for each sphere of interest and should support ISUOG to deliver more comprehensive programming, including monitoring for results and impact.

## Conclusion and recommendations

ISUOG has a strong comparative advantage with an enormous network of professionals with technical expertise in imaging and well-developed training curricula. ISUOG can continue to further develop and exploit this expertise and work with partners in other domains on effective ultrasound implementation that addresses training, health system factors and universal access (5AQ). The report provides recommendation for the planning and design of comprehensive programming in partnership with other global and local experts.

# 1 Introduction

Since 2008 the International Society of Ultrasound in Obstetrics & Gynecology (ISUOG) aims, through *ISUOG Outreach*, to bring comprehensive and sustainable obstetric and gynaecology ultrasound education to lower resourced settings through a train the trainer's approach. After its inception the strategy further evolved (in 2015) to strengthen partnerships with governments and expand ISUOG Outreach's basic training curricula for national implementation. In 2020, a new strategy was proposed to allow for greater impact and potential for advocacy within the international system (see annex 1 ISUOG Outreach Theory of Change).

Within that ambition, ISUOG aims to move to more comprehensive programming for its areas of impact: training & education and beyond, including global access to obstetric & gynaecology ultrasound and health systems strengthening.

This report is the result of an assessment that serves to inform ISUOG outreach on its current impact and opportunities in its future strategies. This can further enable ISUOG to be more strategic in establishing partnerships and seek programmatic funding.

## **2 Background**

### **2.1 Background of the ISUOG Outreach program**

Since its inception in 2008, ISUOG Outreach conducted train the trainer programs in Ghana (2010), Lebanon (2011), Mongolia (2012), rural Australia (2014), Papua New Guinea (2016), Myanmar (2017) and is currently active in 5 countries – Oman, Sudan, Rwanda, Kyrgyzstan and Haiti. For implementation ISUOG collaborates with local stakeholders, including governments, medical professional associations and service delivery organizations (e.g. hospitals, NGO's).

The country programs are preceded by a site evaluation needs assessment and after positive review followed-up by two phases. Phase 1 consists of three trips of one-week, where a cohort of in-country selected trainees is trained on essential topics of ISUOG's basic training program in a combined theoretical-practical curriculum. In between the courses the trainers and trainees stay in contact through a Whatsapp group, share cases and feedback to each other. A cohort usually consists of 25-30 trainees who are trained by 5-6 volunteer trainers from ISUOG. This allows for sufficient supervision with the practical aspects that are provided in smaller groups. Professional background of trainees vary and are context-specific, but may include obstetrician-gynaecologists, general doctors and sonographers. Annex 2 provides an overview of typically covered topics.

During phase 1 trainees are closely monitored and assessed through pre- post-tests and clinical observation. By the end of the first phase, a number of 5-7 trainees that excel in theoretical knowledge, practical skills, training skills and communication are selected to proceed to phase 2 and become trainers themselves.

### **2.2 Purpose of the current assignment**

The current assignment should serve to understand ISUOG Outreach's current capacity & impact, align these with the global needs and inform its future strategy for sustainable impact.

#### **2.2.1 Objectives**

The specific objectives are to:

- Review and understand ISUOG Outreach's current mode of operation and impact.
- Explore ways for ISUOG Outreach to expand its breadth and depth of work.
- Identify opportunities of expansion and impact.
- Assist ISUOG Outreach in producing solid recommendation to develop and implement a broader strategy.

#### **2.2.2 Audience**

This report is intended in the first place for ISUOG and its outreach committee and may serve as a strategic document for future operation and program design. Parts of the report may be used for establishing partnerships and seek programmatic funding.



## 3 Methodology

### 3.1 Approach

ISUOG outreach vision –every woman should undergo a safe and patient-centred quality ultrasound (US) as part of their healthcare evaluation – and its current theory of change (annex 1) were taken as a starting point to define ISUOG's spheres of interest and use these as a theoretical framework.

Four spheres of interest were defined:

1. Training & education - Ultrasound providers are equipped with sustained skills & knowledge
2. Health system Strengthening - Health systems are strengthened to deliver safe and quality ultrasound services
3. Global access -Women have access to safe and quality (obstetric and gynaecological) ultrasound (as part of reaching Universal Health Coverage - UHC)
4. Advocacy - Policy makers are committed to make ultrasound part of their UHC agenda

All tools were built around these four themes that represent ISUOG's spheres of interest. A waiver for full ethical review was obtained, based on the fact that participants were only involved in their professional capacity (Waiver letter in annex 3).

### 3.2 Scope

ISUOG Outreach identified three case study countries where it would be feasible to conduct the below described research activities – Oman, Sudan and Rwanda. This convenient selection is based on the current connections and availability of contact details.

### 3.3 Methods

#### 3.3.1 Document review

In order to get a better understanding of the content and results of the program, program documents were reviewed, including:

- Project charters
- Trip reports and final reports of projects in the case-study countries
- ISUOG annual reports
- Monitoring data – this was only available for Oman and consisted of pre- and post-test results for all trips and practical assessment results.

#### 3.3.2 Self-administered online survey

An online survey was distributed through Survey Monkey software to trainers, trainees and other stakeholders involved in the three case-study countries, to capture their experiences with the program as well their suggestions for strengthening the program. Questions asked were based on the four thematic areas as described under approach. A skip logic was applied for non-trainees on the questions that assessed training experiences and effects. The questionnaire can be found in annex 4.

Data were collected in a course of two weeks between June 21 and July 4. The survey was distributed through email directly to those people of who contact details were available

and further distributed through Whatsapp groups and snowballing. See findings section for characteristics of respondents.

### 3.3.3 Key-informant interviews

Key-informant interviews were conducted between June 21 and July 4 with stakeholders related to the three case-study countries. For each country outreach volunteers (project leads and trainers) and outreach recipients (local project liaisons, trainees) were invited. Of the 18 invitees, 7 responded (see findings section). The topic guide can be found in annex 5.

### 3.3.4 Literature study

A scoping review was done to identify lessons and best practices on US education and implementation in low-resource settings. The search terms that were used are outlined in Table 1 and run through Pubmed and Google Scholar.

*Table 1 Search terms literature review*

Themes	Search terms (not complete yet)
<b>Ultrasound</b>	(maternal-fetal OR women OR reproductive OR gynaecology OR obstetric) ultrasound, sonography
<b>AND</b>	
<b>Outreach</b>	Low resource setting, Low income country (LMIC), outreach
<b>AND</b>	
<b>Global access</b>	Access, universal health coverage (UHC)
<b>OR</b>	
<b>Health system strengthening</b>	Health system, financ*, primary care, primary health care
<b>OR</b>	
<b>Training &amp; Education</b>	Training, education, curricul*
<b>OR</b>	
<b>Advocacy</b>	Advocacy

Due to the fast developments in US and technologies a filter was applied for publications of the past 10 years. Peer-reviewed articles and grey literature of the past ten years that were relevant for the four thematic spheres of interest were included.

## 3.4 Analysis

Survey data were analysed through the survey monkey software on qualitative data through coding on the four thematic themes. Triangulation of results was applied to strengthen the findings.

## 3.5 Limitations

The assessment faced the following limitations:

- Data were collected within a short time frame, allowing relatively little time for participants to respond. Even though the participants were notified two weeks prior to data collection that it was going to take place. Other reasons for low-response rate may have been the current Covid-wave in some of the case-study countries and therewith the overburden of health system and staff.
- The relative low response rate may affect the generalizability of the data, especially for the survey questions on training effects and retention of knowledge.

For Rwanda 12 trainees filled out the survey of 27 people trained (response rate 44%), for Sudan this was 7/28 (response rate 25%) for Oman 1/27 (response rate 0.04%). Data collected were treated qualitatively with caution and were hardly generalised. All data were triangulated in the light of program monitoring data and available published literature.

- Program monitoring data were limited to pre- and post-test results. No monitoring on other indicators for training, access or health system/service delivery were available.
- Case study countries were pre-selected by ISUOG. They are the three countries who were already ahead with the implementation of the outreach program. For learning lessons it would also be interesting to study the situation in other previous project countries, that may have been less successful, such as Somalia or Ghana.

## 4 Findings

The findings chapter starts with an overview of the three case-study countries; description was based on the document review. The following section focus more on the findings from the survey, key-informant interviews and literature review. The data are triangulated and findings described for all four spheres of interest: training & education, strengthened health systems, global access and advocacy.

### 4.1 Description of the program in three case-study countries based on the document review

This section provides a description of the program in the three case-study countries, based on the document review.

#### 4.1.1 Sudan

In November 2016 ISUOG Outreach, in partnership with the state Ministry of Health, North Khordofan University, the Sudanese Family Planning Association and SALMAT NGO, launched the program in El Obeid, North Khordofan. Over the space of two years 28 trainees were trained in three training sessions for phase 1<sup>1</sup>. The project deliverables for Sudan phase 1 were described as below<sup>2</sup>:

- Output: Training dedicated trainees in basic ultrasound in OB/GYN scanning and hone in on their skills by evaluating their progress and provide mentoring between programs.
- Outcome: Trainees competent OB/GN ultrasound scanning will increase level of anomaly identification and aid in preventing preventable causes of maternal mortality locally.

No raw monitoring data were available for the research team. According to the synthesis of monitoring data there was an increase of 17% at post-test (day 5) compared to pre-test (day 1) during the third trip, while retention of knowledge between trip 2 and 3 was 82%.<sup>1</sup> Seven trainees were selected to become trainers for phase 2. However, after a coup in Sudan, the program was brought to a halt and is still awaiting the start of phase 2.

#### 4.1.2 Rwanda

In October 2019 a first trip for the project in Rwanda phase 1 was conducted, in collaboration with the Rwandan Ministry of Health and the Rwandan Society of Obstetrics and Gynaecology. Twenty-seven trainees were trained in Masaka Hospital, Kigali.<sup>3</sup> The project deliverables for Rwanda phase 1 were<sup>4</sup>:

- Output: Trainees competent and confident in OB/GN ultrasound scanning, and are able to provide training to midwives and nurses in Health Centres.
- Outcome: Increase level of anomaly identification and aid in preventing preventable causes of maternal mortality locally.

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<sup>1</sup> ISUOG (2018) Final program report Sudan.

<sup>2</sup> Project charter Sudan.

<sup>3</sup> Rwanda Phase 1 Trip 1 project review.

<sup>4</sup> Project charter Rwanda.

Knowledge increase was measured through pre-post tests with a difference of 20% for the theoretical assessment and 16% for the practical assessment.<sup>3</sup>

Before trip 2 could take place, the Covid-19 pandemic emerged and the trip has been postponed since.

### 4.1.3 Oman

Oman project phase 1 started in 2017, in collaboration with the Omani Ministry of Health and the Royal Hospital of Muscat. GE Healthcare provided US machines and simulators to the Ministry of Health throughout the program. Over the space of two years 27 trainees were trained in three training sessions for phase 1. Five trainees were selected to become trainers and further enrolled training throughout the country during phase 2.<sup>5</sup> The project ended in May 2021.

The project deliverables for Oman phase 2 were<sup>6</sup>:

- Output: Empowering dedicated local trainers in training basic ultrasound in OB/GYN scanning and hone in on their skills by evaluating their progress and provide mentoring between programs.
- Outcome: Trainers will be competent in delivering OB/GN ultrasound training to help increase level of anomaly identification and aid in preventing preventable causes of maternal mortality locally.

Throughout phase 1 the retention of knowledge was monitored and reached 82% at the start of trip 3 (from 54% at the start of Trip 1), while for the practical skills retention reached 67% at the start of trip 3 (from 27% at the start of Trip 1)<sup>6,7</sup>. No monitoring data were available for the outcomes of phase 2.

An additional outcome was the launch of OSUOG (Omani Society of Ultrasound in Obstetrics and Gynecology) which will be the main society to implement the Basic Training Curriculum of ISUOG as the national curriculum at both the National Training University (Sultan Qaboos) and via continuous US training throughout the country<sup>8</sup>.

## 4.2 Characteristics of respondents to survey and qualitative interviews

### 4.2.1 Survey

Thirty-one (31) respondents filled out the survey between June 21 and July 4 2021, the majority was male (71% male; 29% female). A majority of the respondents was related to the program in Rwanda (15 respondents) or Sudan (11 respondents<sup>9</sup>), four respondents were related to Oman and one ISUOG volunteer indicated to be involved with the program in multiple other countries.

As convenient sampling was applied and the survey was distributed through snowballing it is not possible to define the accurate response rate, but looking at the number of trainees in each country we can define a response rate for trainees of: 44% (12/27) for Rwanda, 25% (7/28) for Sudan and 0.04% (1/27) for Oman.

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<sup>5</sup> ISUOG (2019) Oman outreach final project report.

<sup>6</sup> Oman project charter phase 2.

<sup>7</sup> Vrachnis N, Cohen-Overbeek TE; collaborators. ISUOG ultrasound training in Oman: evaluating participant long-term retention and the effect of repetitive practical courses on ultrasound knowledge and skills [published online ahead of print, 2021 Mar 24]. *Ultrasound Obstet Gynecol.* 2021;10.1002/uog.23632. doi:10.1002/uog.23632

<sup>8</sup> ISUOG CEO brief on outreach.

<sup>9</sup> Ten respondents indicated to be related to Sudan, one respondent indicated 'other', but answered 'Sudan' in the comment field, making the total number of respondents involved with the program in Sudan is eleven.

Most of the respondents were obstetrician/gynecologists (25/31), others were radiologist/ultrasonographer (3/31) or a professional in maternal-fetal medicine (3/31) and one general practitioner.

Respondents were involved with the program in a variety of capacities (see Table 2). Most respondents that identified themselves as trainee (N=21, including trainees selected as a trainer for the next phase), were gynaecologist/obsetricians (90%) and worked at the secondary level of the health system (90%). Six trainees also worked at the private level.

*Table 2 Answers to the survey question 'In which capacity were you involved with ISUOG Outreach program/training?'*

ANSWER CHOICES	RESPONSES	
Outreach volunteer	19.35%	6
Trainee	41.94%	13
Trainee selected as a trainer for the next phase	25.81%	8
Involved in local project coordination	16.13%	5
Public sector (including NGO or government)	0.00%	0
Policymaker	0.00%	0
Other (please specify)	0.00%	0
Total Respondents: 31		

#### 4.2.2 Key-informant interviews

For each case-study country six stakeholders, including outreach volunteers, local project coordinators and training recipients were invited for a qualitative interview. Response rate was 39%, resulting in 7 key-informant interviews (see Table 3).

*Table 3 Overview of key-informant interviews*

Number of interviews per country	Type of respondents
Oman (3)	Outreach volunteers (2), local stakeholder (1)
Sudan (2)	Outreach volunteer (1), local stakeholder (1)
Rwanda (2)	Outreach volunteers (2), local stakeholder (0; Non-responded)
Total (7)	Outreach volunteers (5), local stakeholders (2)

## 4.3 Training and education

Training and education is at the core of ISUOG's theory of change. The outreach program provides a comprehensive opportunity to equip care providers with the needed skills and knowledge on the use of US in their practice. In this section we are compiling the results from both key-informant interviews and the survey regarding the training and education. Participants of the study had shared their insights on the impact of the training, retention of knowledge, and sustainability of the program.

### 4.3.1 Results from qualitative data collection

#### **The training had observable results on the knowledge and skills of the trainees**

Almost all (96%) of the survey respondents indicated a need for the program or that it fills a gap that no other programs address. Although one respondent indicated that the outreach program partially overlaps with other programs in the country, all respondents confirmed that there was no formal training or capacity building on the use of US. Trainees expressed positive feedback on the training in all monitoring documents that were analysed<sup>10</sup>. One trainer noted minor conservations over the training methods, related to too passive teaching, and the big group number. However, the analysis of responses of post training surveys, showed that participants were generally satisfied with the training, and indicated how the training helped them to improve practical skills like holding the probe, conducting better sections, anomaly scans, and many others. The improvement in skills and knowledge was also well documented in the published study by Vrachnis *et al.*, (2019). The study found that in Oman training participants could achieve significant improvement in the both the theoretical knowledge test and the practical test.

#### **Training had considerable impact on the self-reported quality and daily practice of trainees**

Survey respondents reported impact on the quality of their scans and reduced missed cases (See Table 4). This complements the finding from the interview where a trainee indicated that they could recognise early signs and were able to refer the cases on time. In addition, survey respondents also highlighted that the training had allowed them to share their gained knowledge with others and improved their communication skills with patients. Non had indicated that the training had no impact on their practice.

*Table 4 Answers to the survey question: What is the impact of training on your daily practice?*

ANSWER CHOICES	RESPONSES	
It had no impact on my practice	0.00%	0
I diagnose more cases that I would miss before	82.35%	14
The quality of the scans I make has improved	94.12%	16
My communication with the patients has improved	52.94%	9
I have increased the number of scans	29.41%	5
During work, I have been able to share my gained knowledge with others	88.24%	15
Other (please specify)	0.00%	0
Total Respondents: 17		

Besides technical knowledge, interview respondents explained that during the training participants learnt about work flow management, and other organisational skills, which

<sup>10</sup> Trainee Feedback Survey –February 2020, Final Program Report Sudan, Oman Final Report (2)

help them in achieving best results in the most efficient way. One trainee explained that these skills helped him to organise his work flow which allowed him to increase the number of scans.

Trainees also explained how the training had improved the process of referrals. They knew a network of well trained personnel who they can refer to. One respondent specialist highlighted that now he could notice that trainees were able to manage more cases on their own, without having to refer to the specialist as much as they used to do before receiving the training.

**Some quotes on quality and skills:**

“Sometimes the quality of the images I get from Oman is better than what I get from trainees here, because taught them from scratch, we showed them from the start how it should be done.” – outreach volunteer

“The machines do not show abnormalities, the well trained staff do” – trainee, Sudan

“If you have never seen someone doing a good scan, you don’t know what the possibilities are. Just as an example, one time In Sudan someone brought me a patient 18wks pregnant of triplets. I talked them through the whole scan. Through that I think he realized where his skills needed to go. When you do see an expert scan, you recognize where your learning curve should be” – outreach volunteer

**Factors that facilitated the application of acquired knowledge and skills were mainly continuous training and mentoring from the ISUOG outreach team**

Via both key informant interviews and the survey, we could identify several enabling factors that allowed the respondents to apply their knowledge and skills. Our respondents indicated continuous training and the mentoring from ISUOG outreach team as the most important factors. Table 5 summarise other determinants identified in the survey, such as support from the employers, collaborative colleagues, good infrastructure, availability of time, and available equipment.

*Table 5 Answers to the survey question: What are the factors that allow you to apply your acquired skills and knowledge?*

ANSWER CHOICES	RESPONSES	
Support of our employer	35.29%	6
collaborative colleagues	47.06%	8
good infrastructure	35.29%	6
time available	29.41%	5
continuous training	76.47%	13
mentoring from ISUOG outreach team	70.59%	12
available equipment	41.18%	7
none of the above	0.00%	0
Other (please specify)	5.88%	1
Total Respondents: 17		

The training also provided an extra income for practitioners who are now able earn money in private practices. Several practitioners in Sudan had bought their own machines as they were more confident about their ability to provide the service independently.



Only a few respondents indicated to experience barriers to the application of acquired skills, such as a busy work schedule/no time or no working equipment. One respondent indicated that the training is not well adapted for the national context. This was also confirmed by some through the interviews.

**Participants were able to retain the knowledge and skills, depending on self-learning and the use of the WhatsApp group**

Interviewed trainers noted the improvement among trainees between phase one and two. One trainer was very pleased to see trainees presenting interesting cases from their own practice. Vrachnis et al. also documented long term retention and the effect of repetitive courses (Vrachnis and Cohen-Overbeek, 2021). Albeit little deterioration in the result of the pre-test during the second course, the article showed that at start of the third course, participants had retained all knowledge and skills from the first course.

The quality practice of US, as for many other specialist skills, needs commitment and practice. It takes personal initiative and motivation to improve own skills and that depends on the individual's motivation. Most participants were committed. According to one of the interviewees only four people out of 28 were lost on the course of three years in Sudan.

All trainees who filled the survey confirmed that they were able to sustain all (53%) or some (47%) of the skills and knowledge. 70.5% of respondents indicated they depended on self-learning to sustain their knowledge. Furthermore, continuous training and the mentoring from ISUOG outreach team were selected by most survey respondent as the main factors that allowed them to apply their acquired skills and knowledge. Only one respondent indicated acquiring Continuous Medical Education (CME) Credit.

ISUOG provided trainees with a one year free membership and access to the online learning platform where they can find several useful resources. Several respondents explained that the limited time and busy schedules prevents trainees from using the available online resources and online trainings.

As most people have access to mobile phones in Oman, Rwanda, and Sudan, trainees and trainers were all very contented about the effectiveness of using WhatsApp as a mode for sharing knowledge, insights and advises. Interview respondents indicated that they use the national WhatsApp group regularly. National practitioners and international experts used such groups to share interesting cases for discussions and for asking questions. National and international trainers were available to answer questions. This provided a prompt tool to ensure the continuation of the learning process even after the training is finished. Such lay mode of communication improved accessibility of practitioners in remote areas to experts and support systems that they would not normally get. The use of WhatsApp group also proved COVID-19 proof. It allowed easy reach to knowledge and support even when physical contact or travel were not possible.

Some trainers also expressed concern over the level of activity on their country WhatsApp group. Only few participants were proactive in sharing cases and images, while many trainees were more passive. It needed extra effort from the trainers to motivate active participation on the groups.

Another initiative to support participants in the program was the virtual mentorship program that was established in Oman after the training. Participants had to fill in a logbook with cases, watch presentations, and present cases themselves. This was an attempt to further commit them to continuous education. However, it was not as successful

as planned. Possible factors that were mentioned for the inactivity of the mentorship program were COVID-19 and high turnover of staff at ISUOG. The virtual mentorship did not succeed in Sudan either. Participants were too busy to commit to uploading their assigned cases. One trainer suggested that the program should be better structured and should be managed by ISUOG local staff. This can help in holding participants accountable and making sure the program is reaching its goals.

**Refresher courses, in addition to local regular seminars and workshops were also suggested by trainers and trainees** as good opportunities to retain and develop the knowledge and skills acquired during the trainings. Such sessions can be organised virtually or physically. It will allow practitioners to share their cases in a less formal setting compared to international seminars and conferences.

Table 6 summarizes the other tools that were suggested by survey respondents to sustain longer term knowledge and skills. Besides courses and seminars, respondents were keen on provision of self-learning resources, peer to peer feedback, coaching and mentoring, and accreditation and CME credits.

*Table 6 Survey responses to question: How should longer term quality of skills and knowledge be sustained?*

ANSWER CHOICES	RESPONSES	
Refresher trainings	85.71%	24
Peer-to-peer quality control & feedback	46.43%	13
Coaching & Mentoring	57.14%	16
Accreditation and CME credits	42.86%	12
Provide resources for self-learning	67.86%	19
Organise scientific meetings	39.29%	11
Other (please specify)	0.00%	0
Total Respondents: 28		

### **Trainees were able to share their knowledge with colleagues**

The vast majority of trainees indicated that during work they had been able to share their gained knowledge with others. Even if not selected as trainer, respondents indicated in the survey that they shared their knowledge through formal training, informal peer to peer contact, mentoring/coaching, or during scientific meetings. Only 1 trainee responded that he/she was not able to share their knowledge.

All 8 trainees who filled the online survey and were selected as local trainers showed confidence that the training they received could allow them to train others. They all did roll out/train an average 21-50 others each.

Also some challenges in sharing knowledge were mentioned. Besides being busy and having limited availability of time, the lack of infrastructure, the lacking availability of advanced machines or of interested learners, and the lack of training materials that are simple and in local language were mentioned barriers that hindered sharing the knowledge. Although many respondents of the survey indicated that resources in local language are suffice or not needed in their context due to using English as an official language among practitioners, around half of the respondents stayed neutral, or disagreed with the statement about having enough resources in their own languages.

**Contextual factors, such as government support, local partners involvement, accreditation, distance, time availability, and COVID that played a role in the success of the training program.**

Respondents of the interviews drew on their experiences in the three countries, and how the contextual factors play a significant role in the success or the restraining of the outreach program. For example, in Oman, the program was initiated by a national team in collaboration with the local government. They provided the support needed and committed to buying the machines.

Respondents also indicated that such collaboration with local authorities and institutions is important, not only with the government and ministry of health, but also with national universities. This can give credibility and attract more participants.

One interview respondent explained that the outreach program had started as an international program with western perspective which generally assumes that services are primitive and practitioners do not have any knowledge or skills, this can be true in some contexts, but for many others the curriculum could be perceived as too basic, and it stays at an introductory level. Involvement of national experts in curriculum design and training is important to ensure relative knowledge and understanding of local contexts. National teams are corner stone in the program and its sustainability. In alignment with the program, the Omani Society of Ultrasound in Obstetrics and Gynaecology started in 2020. Even though a young organization, they were able to conduct lectures and seminars both online and face to face. They are also helping in identifying new trainers and ensuring the capacity building of practitioners in the country. Having a strong and motivated national team was helpful to liaise with local partners, find solutions for problems on the ground, and most importantly provide contextual technical and logistical support to the international team and trainers. This can also ensure the adaptability of the program curriculum and its cultural sensitivity.

Interview respondents appreciated the quality of the curriculum and the expertise of international trainers and program developers, however, one weakness that was mentioned several times was the accreditation for the course. Due to legal and logistic concerns, the program could not provide CME credits, or any other qualification (other than certificate of participation or certificate for qualified trainers). Participants were wondering if there are possibilities to establish a system for accreditation through national and international educational institutions. It would motivate active participation, retention, and sustainability of the program. It would also ensure credibility and quality of the program and professionals. One suggestion was to link the certificate to achievement of certain competencies like: active participation, sharing the required cases, improving quality of shared images, presentation in conferences, etc.

The program made sure to include participants from remote and rural areas around the three countries. This in turn could make sure that the impact of the program is far reaching for beneficiaries and women in such underserved locations. The program supported those participants with transportation and provided financial support. This was highly appreciated. The support of the ministry of health is again important in this. In Oman, participants did not lose their income for going to the training, while in Rwanda, it was more challenging to assure the participation due to loss of income. Participants had to leave to their private clinics to ensure the business kept running. In Sudan, one participant had to drive 1000 miles to reach the training. This also shows the level of dedication and commitment.

Trainers felt they were not always aware of how busy the training participants were. Many participants have to work in their private practice beside their public work. Some would leave to work after the training day. That makes them end up with sleepless nights and being tired, or missing some of the sessions.

The COVID situation affected the program in some countries more than others. In Rwanda, the trainers could not travel to conduct the training. Trainers showed concerns also about online training due to problems with connectivity.

In Sudan, the program had gone through only the first phase, then came the coup. They had been recovering since then, and only now they are starting to work again on the next phases.

#### **Standardised monitoring system is needed**

Monitoring and follow up should be essential components of the program. Projects leads showed a lot of care on the process of follow up with their participants. In countries where the leads paid close attention to follow up with participants on their evaluations, they could ensure retention and the preparation of more potential trainers who are committed to the program. One trainer commented on the effectiveness of using the same test for pre and post training and how using the same questions can be inaccurate in measuring the improvement in knowledge and skills.

One trainer also highlighted the need for a structured monitoring plan that standardises some indicator. This would allow provision of data on real results and impact of the program, such as number of USs performed, number of anomalies diagnosed, how many referrals, patient satisfaction, etc. Such data could be also useful for advocacy and policy making.

### **4.3.2 Lessons and best practices identified in the literature**

A number of studies have shown the positive effect of ultrasound training, often done in combination with task-shifting and tele-ultrasound (Swanson *et al*, 2016; Henwood *et al*, 2017; Vinayak *et al*, 2017a; Kim *et al*, 2018; Dreyfuss *et al*, 2020; Drake *et al*, 2021). However there is no adequate evidence available on the effectiveness on patient outcomes or on the sustainability of courses after donor funding has ended (Kim *et al*, 2018). Several resources make suggestions for the construction of sustainable education programs, including analysis of needs assessment findings, development of locally relevant curriculums, addressing health system factors, quality assurance and follow-up plans, strategic partnerships, and outcome measures (Henwood *et al*, 2014; Mollura, Culp and Lungren, 2019; Luntsi *et al*, 2021). As the local needs of the trainees and the consequences for the patient vary per setting, based on the health system context where they are in, curricula will have to undergo modifications or sometimes be re-created from scratch to tailor a program to the target site. Simultaneously, the creation of a sustainable education program is essential for after the educator leaves (Mollura, Culp and Lungren, 2019).

The income generating effect that was seen for the ISUOG program in Sudan is sometimes explicitly used within projects. Amref's Kenya Innovative and Sustainable Solutions for Midwives Education and Employment (KISSMEE) initiative explored a potential income model for midwives in an area where only 30% of graduated nurse-midwives get formerly employed (Philips webinar, 2021). DoctHERs<sup>11</sup> in Pakistan explores models in which female health professionals that stop working after marriage can continue to contribute their skills while working from home through telehealth constructs, where they are connected to lower-level frontline health workers in the field to support them with diagnosis, prescription, referral and other professional consulting (Philips webinar, 2021).

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<sup>11</sup> <https://www.docthers.com/>

The other side of the empowering effect of income-generation is the risk that it affects the affordability access to services and that quality may not be guaranteed. As part of having a sustainable trained workforce, ongoing supervision and guidelines are required for successful and quality ultrasound service provision. In a narrative review on achieving universal access to obstetric ultrasound in resource constrained settings, Luntsi et al. (2021) describe how the absence of proper supervision and guidelines for practitioners has also allowed untrained people to carry out ultrasounds, which may create an environment for abuse and misuse and therewith leads to potential harm to the patient. Ongoing quality ultrasound services and training require political will and local governance to regulate services and assure quality. This means that appropriate guidelines should be in place on who should provide the services, the required level of training and certification and appropriate supervision to avoid over-use, under-use and/or abuse. A regulating authority where professionals and facilities providing ultrasound services are registered and quality assurance of the services is monitored and controlled will improve the quality of services. This implies the use of second opinions and mandatory continuous education for all practitioners. And a system where service provision is strictly hinged on the mandatory updates (Luntsi *et al.*, 2021).

### 4.3.3 Considerations for the future

Based on the findings above the following considerations could be taken into account for future programs:

- The current methodologies and train the trainer approach seem to be effective. However, attention should be given to a **clear and standardised monitoring system** for the training and knowledge retention.
- Content of the current curriculum seems to be effective and consists of highly expertise knowledge. However, more attention can be given to **the contextualization and adaptation to local relevance and needs**.
- The curricular elements could **adopt a system for accreditation and certification** that meets the needs of respondents and local stakeholders. Simultaneously ISUOG could work with local authorities on the **governance system to regulate services and assure quality**.
- Retention of knowledge and skills is essential. ISUOG can further contribute by ensuring the **accessibility to resources for self-study**, provision of national workshops and refresher trainings. **Motivation for participation can be linked to the required accreditation and local quality assurance mechanisms**.
- Adoption of lay tools for direct communication such as WhatsApp facilitates sharing knowledge and consultations. Other initiatives like the virtual mentorship program might need to be reassessed.
- **Sharing knowledge** should continue to be encouraged, not only through formal trainings, but also through peer to peer and via regular scientific meetings.
- **Contextual factors should be taken into consideration when planning and implementing the outreach program**. This includes also health system factors that will be discussed in the next section.

## 4.4 Strengthened health systems

A strong health system is essential for the success of the outreach program. ISUOG theory of change puts health systems strengthening as one of its impact areas to ensure reaching their vision. As part of the program planning, the society organises a pre assessment and site visit that look into the country capacity and needs.

### 4.4.1 Results from qualitative data collection

According to the survey respondents (Table 7), lack of training was the main health system challenge to the implementation of obstetric and gynaecological ultrasound, followed by shortage of human resources, shortage of equipment, lack of monitoring and quality assurance and lack of maintenance. According to the respondents, the ISUOG outreach program was addressing all these challenges to some extent, except for the shortage of equipment and lack of maintenance (Table 8). It must be emphasized that this is the perception of survey respondents. Program data did not monitor on health system indicators.

*Table 7: Survey responses to question: What do you see as the main challenges in your national health system when it comes to the implementation of obstetric and gynaecological ultrasound?*

ANSWER CHOICES		RESPONSES
None of the above		0.00% 0
Shortage of human resources		66.67% 16
Shortage of equipment		66.67% 16
Maintenance of equipment		37.50% 9
Lack of training		75.00% 18
lack of monitoring and quality assurance		58.33% 14
Poor information management system		16.67% 4
Poor referral mechanisms		29.17% 7
Inappropriate use (overuse/misuse)		20.83% 5
The importance/need is not recognized by the policy makers		20.83% 5
Other (please specify)		8.33% 2
Total Respondents: 24		

#	OTHER (PLEASE SPECIFY)	DATE
1	a-community awareness needed regarding: 1-intervention decision taken based ultrasound findings 2-proper timing of scans b-midwifery training programs	7/1/2021 4:16 PM
2	Medical politics. Those who have had advanced training don't want others to have the knowledge	6/17/2021 8:27 PM

Table 8 : Survey responses on how much influence does the outreach program have on each of the health system factors.

	VERY POSITIVE INFLUENCE/CHANGE	PARTIAL INFLUENCE	NO INFLUENCE	I DO NOT KNOW	NOT APPLICABLE AS THIS IS NOT A LOCAL CHALLENGE	TOTAL
Shortage of human resources	52.17% 12	21.74% 5	13.04% 3	13.04% 3	0.00% 0	23
Shortage of equipment	12.50% 3	33.33% 8	41.67% 10	8.33% 2	4.17% 1	24
Maintenance of equipment	12.50% 3	33.33% 8	33.33% 8	12.50% 3	8.33% 2	24
Lack of training	79.17% 19	12.50% 3	4.17% 1	4.17% 1	0.00% 0	24
Lack of monitoring and quality assurance	33.33% 8	37.50% 9	20.83% 5	8.33% 2	0.00% 0	24
Poor information management system	13.04% 3	17.39% 4	34.78% 8	26.09% 6	8.70% 2	23
Poor referral mechanisms	22.73% 5	18.18% 4	27.27% 6	18.18% 4	13.64% 3	22
Inappropriate use (overuse/misuse)	22.73% 5	40.91% 9	18.18% 4	18.18% 4	0.00% 0	22
The importance/need is not recognized by the policy makers	22.73% 5	31.82% 7	22.73% 5	9.09% 2	13.64% 3	22

**Addressing the training gap in the health system: Although there are some initiatives to incorporate the program in national trainings, it is not fully incorporated yet**

Sustainability of the program remains a concern of interviewed respondents. The program model and aim to train national trainers who in turn can carry on the future trainings is important for sustainability. However, respondents indicated that in most countries, the program is not yet able to show the ability to survive by itself. More involvement of national partners and advocacy could improve that.

There were some initiatives to incorporate the curriculum in residents training for the Gynaecology and Obstetrics specialty. For example, in Oman, national trainers who received their training through the ISUOG outreach program, are providing some sessions for residents in training. Although it seemed like an individual initiative, interviewees emphasize that such initiatives should be harnessed and expanded, maybe also to other specialties like radiology. One respondent from Sudan explained that gynaecology and obstetrics specialists might find it easier and more acceptable to refer to colleagues in another specialty than to a colleague in the same specialty (especially in private sector that plays big role in providing health services). Other considerations that were mentioned on incorporating the training in national programs are the format of training (workshop of few days, or a separate training session) and how such training would affect the job description.

**Shortage of equipment and lack of maintenance and cleaning are other main challenges faced by health systems in different countries**

In parallel, shortage of equipment, especially in remote and small centres, was one of the main challenges identified. The program attempted to be involved in procurement or provided funds in some countries to get machines, at least for training, but that was limited. Respondents indicated that ISUOG can also play a role in this in the future. One sponsor brought their machines to the training in Sudan. Following this, specialists attending the training had bought the machine for their own private practice.

Other challenges that were mentioned and where the outreach program had less influence, were poor information management systems, poor referral mechanisms and that the policy makers do not recognise the importance or need of US (Table 8). Such factors were variable from one country to another. Trainers and project lead in Oman for example, explained that the system is relatively well organised. There are good quality machines in primary care level, with a good referral system, while in Sudan respondents indicated that the machines were available only in bigger hospitals.

**Human resources management is one part of the efforts for health system strengthening.**

Human resource management includes training, but also availability, retention, commitment, and salaries of staff. Busy staff who cannot find time for continuous education or dissemination of their knowledge was a challenge that almost all study respondents in survey and interviews did highlight. Due to low salaries in the public sector, interviewed respondents indicated that many colleagues must work late in a private practice to ensure good living.

**Availability of good quality and reliable data would allow well informed decision making.**

Interview respondents drew the attention to the importance of good system for monitoring and evaluation of the services delivery in general, not only the training program. Such data can allow continuous quality improvement.

**Collaboration with national government is key for success**

National governments were collaborative to some extent according to 96% of survey respondents. This was evident also from the interviews, especially in Oman. Close collaboration with the local authorities ensures the success of the project, national ownership, and sustainability of the results.

**Private sector plays a big role in service delivery**

Interview respondents mentioned the role of the private sector in service delivery. Private centres have high quality modern machines, but still face the challenge of the availability of well-trained staff. Although being under control of the Ministry of Health, compared to the public sector where there are guidelines on the use of machines, respondents highlighted the fact that there can be a noticeable overuse in private sector, sometimes for only financial benefits. Even if they have to pay more, women might prefer the private sector as they perceive they are getting more services and diagnosed better through doing more US examinations.

**The study respondents identified the following priorities where ISUOG can expand its impact in strengthening the health system:**

- To work closely with the ministries of health and other national institutions
- Tailoring the training program to the specific local needs, taking into consideration cultural differences and local contexts. For example, establishing referral pathways in collaboration with the ministry of health and other partners.
- Involvement and capacity building of local trainers, via invitations to scientific meetings, and continuous coaching and mentoring.
- Incorporation of the ISUOG outreach training in the speciality training for Obs/Gynae and Radiology. This should be done in collaboration with the ministry of health and the national specialisation boards. One suggestion to do that was to establish local faculties for the training. Certification and qualification was a concern of many



respondents as discussed earlier. Training junior doctors on ultrasound and making the service available at the primary care level rather than secondary level as it is mostly provided now. Some respondents suggested to include the skills of using ultrasound at the level of medical school, not only as a postgraduate.

- To include not only doctors but other service providers who can offer do Ultrasounds like nurses and midwives.
- To engage not only public sector, but also private sector who plays a big role in service delivery in many countries.
- Use of digital health and teleradiology application to serve remote areas and to serve training purposes.
- To ensure the availability of equipment with all needed probes. Also to make sure they are well maintained. Interview respondents appreciated the involvement of ISUOG to provide the machines during the training in some countries.
- Quality assurance and monitoring. This includes a clear qualification and certification system and registration of accredited centres and personnel.
- Continuous education program to retain knowledge and skills
- To ensure affordability of the services, by advocating its coverage in the insurance packages
- To improve health literacy among population. Engagement of women themselves and raising public awareness on the importance and correct use of the US.
- Consultation with local authorities to improve US services and Advocacy to include ultrasound and women's health in general as a priority in health policies
- To identify priority impact targets, for example improving the detection of ectopic pregnancies during the first trimester. This can save the lives of many women.
- To expand on governance, organisation, and other non technical skills in the training curriculum. The training curriculum already includes non technical skills that respondents of the interview mentioned how helpful they were. Such skills can provide the basis for stronger health care system in the future.

**Some quotes on health system strengthening:**

“Women's health is not a priority, so advocating for women should be an important part of ISUOG Outreach. Working with MOH and others in leadership positions to facilitate program development, offer certification of trainers could help bring a country to the tipping point. Testimonials and Peer pressure from bordering countries and medical societies may help” - Survey respondent

“The patients are not involved. I think we need to engage them; we need to ask them what are their needs, what are their barriers” - Survey respondent

#### 4.4.2 Lessons and best practices identified in the literature

A trained health workforce is just one component of the WHO health system building blocks<sup>12</sup>. This literature review describes how a combination of health system factors is essential for the successful implementation of ultrasound services.

<sup>12</sup> For the WHO health systems framework see: <https://healthsystemsglobal.org/news/a-new-era-for-the-who-health-system-building-blocks/> or [https://www.who.int/healthinfo/systems/WHO\\_MBHSS\\_2010\\_full\\_web.pdf](https://www.who.int/healthinfo/systems/WHO_MBHSS_2010_full_web.pdf)

The first look study, conducted between 2014 and 2016 in 58 clusters in 5 countries to assess the impact of antenatal care (ANC) ultrasound on pregnancy outcomes in women residing in LMIC, focused on 1) training of health workers for screening, 2) training referral hospital staff in EMONC, 3) guidance on referral system enhancement and 4) community sensitization activities. In an article about their experiences in DRC, they describe the major challenges encountered, including security and maintenance of the equipment, electricity requirements, health systems integration, and a variety of other systems issues (Swanson *et al.*, 2017). They suggest that future ultrasound interventions should only be conducted within a functioning health system with the required enabling environment, political will, substantial resources and continuous training and retraining. This reinforces the need to ensure that training interventions are conducted alongside health systems interventions to establish an appropriate ultrasound delivery system. The radiology in global health book describes multiple processes that are critical to establishing such systems (see textbox 'processes within the ultrasound delivery system'). A breakdown in any of these processes in the complex imaging chain will defeat the desired outcome (Mollura, Culp and Lungren, 2019).

#### Processes within the ultrasound delivery systems

The common processes include the following:

1. Scheduling of the patient for the appropriate test/procedure
2. Proper equipment to perform the test/procedure (this includes stable reliable electricity, shielded room, imaging equipment, etc.)
3. Appropriately trained personnel to operate the equipment
4. System to transmit and store imaging data and reports (either via printed film or digitally)
5. System to visualize the imaging data
6. Radiologist (or other trained medical professional) to interpret imaging data
7. System to generate a report of the findings and recommendations from the imaging data
8. System to transmit the report to the referring healthcare provider
9. Equipment maintenance program (*all equipment requires maintenance!*)
10. System of continuing education and quality assurance to ensure all equipment is properly maintained and personnel are appropriately trained
11. Financial method of reimbursement to make the system economically viable and Sustainable

The health system challenges for effective implementation of obstetric and gynaecological ultrasound that were identified by respondents in the survey are similar to findings in the global literature. Lack of adequate quality equipment, with secured power supply (via a power point or rechargeable batteries) and secure storage, capacity of maintenance and servicing of these machines are some of the most described feasibility challenges (WHO, 2016; Swanson *et al.*, 2017; Luntsi *et al.*, 2021).

Another concern is the barriers to referral for ultrasound-diagnosed complications, leading to ethical questions on providing a patient with a diagnosis that she cannot be helped with. In the first-look study, 29% of the women who were referred did not attend the referral due to barriers in cost, transportation, distance, disapproval by community members or previous bad experiences with the hospital. Also after reaching the hospital substantial barriers were identified, including not being connected with an appropriate provider, not knowing where to go, and being told to return later. Factors that enabled successful referral were appropriate communication, including description of the ultrasound findings and the reason for the referral, providing a referral card, describing where to go in the hospital, and explaining the procedures at the hospital (Franklin *et al.*, 2018; D. L. Swanson *et al.*, 2019). The researchers foresee a potential for mHealth<sup>13</sup> in strengthening referral systems (J. O. Swanson *et al.*, 2019). mHealth could help in sharing screening results with community health workers who, in turn, could help convince families of the need for supporting referrals. Furthermore it could help to notify hospitals

<sup>13</sup> mHealth of mobile health is a form of digital health that is defined as "the use of mobile wireless technologies for health". See also: <https://www.who.int/reproductivehealth/topics/mhealth/en/>

of referred patients before their arrival and mHealth systems could track pregnancies, building a database with which to better understand pregnancy outcomes in their catchment areas.

Several suggestions are done in the literature to carefully assess and plan for the development of sustainable radiology services. The non-profit organization RAD-AID international developed a radiology-readiness tool that was endorsed by the WHO in 2011. The survey-questions are not OBGYN-specific, but the 16 sections (see textbox) apply to any specialist field that involves ultrasound. Similarly, the WHO recommendations on antenatal care for a positive pregnancy experience provide implementation considerations with regard to the recommendation for routine ultrasound scan before 24 weeks gestational age (see Table 9) (WHO, 2016).

The SIIM (Society of Imaging Informatics in Medicine) Global Outreach Committee, in partnership with RAD-AID International, created the Global Ambassador Program, whose mission is to advance Imaging Informatics throughout LMIC. In Nigeria they successfully installed a Picture Archive and Communication System (PACS) (Elahi *et al.*, 2020).

#### **RAD-AID radiology readiness tool**

The evidence-based core of the Radiology Readiness approach is a customizable 16-part survey tool. The most recent version of the survey is available on the Internet [<https://rad-aid.org/resource-center/radiology-readiness>]. The 16 survey sections are listed below:

1. General and Background Information
2. Community Involvement and Patient Satisfaction
3. Clinical Specialties and Disease Epidemiology
4. Patient Demographics, Capacity, and Referral Patterns
5. Clinical Tests
6. Pharmaceutical Agents and Other Clinical Consumables
7. Human Resources
8. Training and Continuing Medical Education
9. Structural, Electrical, Climate Control, and Transportation Infrastructure
10. Communications
11. Information Technology
12. Medical Imaging Capabilities and Limitations
13. Medical Imaging Device Maintenance
14. Patient Financial Issues
15. Financial Infrastructure
16. Funding of Medical Imaging Services

### 4.4.3 Considerations for the future

Based on the findings above the following considerations could be taken into account for future programs:

- **The Needs assessment prior to the project can adopt a wider health systems lens** and identify health system interventions needed in order to establish appropriate ultrasound delivery systems. These could be taken along in comprehensive programming with partners.
- Apart from training, effective programming for US should **address equipment barriers, task-sharing/shifting, referral strengthening and other health system interventions**.
- Programs should be **tailored to local (education & health system) needs**.
- The curriculum could **expand on governance, organisation, and other non-technical skills** that contribute to capacity building of national staff. The program could also address capacity building and system wide issues regarding quality assurance and image archiving.
- ISUOG could **engage with national stakeholders** like the government, educational institutions, public health experts and health system partners **to design and implement comprehensive programming**.
- **Involvement** of the national society members, trainers, and trainees **in the program planning and execution** can contribute to capacity building and might open the door for other health system initiatives.

- **Program monitoring should include measurements on service delivery** that provide an indication on the impact of the program.. This can also allow the identification of priority impact areas.
- The program should explore **the potential for applications of digital Health in training and service provision.**

Table 9 Implementation considerations for ANC guideline recommendation B.2.4. Routine ultrasound scan (adopted from WHO recommendation on antenatal care for a positive pregnancy experience. Page 148).

	Need to know	Need to do	Need to have	Consider
<b>Health system level</b>	<ul style="list-style-type: none"> <li>- Number and capacity of ultrasound providers to act as providers and trainers/mentors</li> <li>- Number of functional machines available and geographic distribution</li> <li>- Regulations around ultrasound use</li> <li>- Cadres – who can perform?</li> <li>- Available pre-service education and other certification</li> </ul>	<ul style="list-style-type: none"> <li>- Determine appropriate settings and timeline for introduction of ultrasound – Obtain machines – Capacity-building plan</li> </ul>	<ul style="list-style-type: none"> <li>- Transportation for women if services are not sufficiently decentralized</li> <li>- Cadres with skills to provide quality Services</li> </ul>	<ul style="list-style-type: none"> <li>- Cost – of purchase, maintenance, training, impact of shifting resources to ultrasound from other key costs</li> <li>- Local availability/feasibility of service contracts to support machine maintenance, especially in areas not previously prioritized for ultrasound market development</li> <li>- Power supply – availability and stability</li> <li>- Protection from power surges, which can permanently damage machines</li> </ul>
<b>Provider level</b>	<ul style="list-style-type: none"> <li>- Training to do anatomy scan or on referral</li> <li>- How to interpret results and do counselling</li> </ul>	<ul style="list-style-type: none"> <li>- Conduct or refer</li> <li>- Document results</li> <li>- Provide guidance on how to estimate GA and delivery date (EDD), depending on certainty of last menstrual period (LMP) and estimated GA at time of ultrasound, e.g. WHO's Manual of diagnostic ultrasound and the American Institute of Ultrasound in Medicine (AIUM) guidelines</li> </ul>	<ul style="list-style-type: none"> <li>- Machines</li> <li>- Mechanism to review results and get reports</li> <li>- Service contracts for machines</li> <li>- Surge protection</li> <li>- Power supply</li> <li>- Counselling skills</li> <li>- Security and environmental protection for costly machine</li> <li>- Space for machine</li> <li>- Ultrasound gel supply</li> <li>- Staff and supplies to keep equipment clean</li> </ul>	<ul style="list-style-type: none"> <li>- Extreme fragility of ultrasound transducers (one drop on a concrete floor may necessitate purchase of a new transducer, costing thousands of dollars)</li> <li>- Relative benefits compared to other interventions</li> <li>- Burden to mother</li> <li>- Burden to providers and facility</li> <li>- Creative, alternative models of service delivery that do not burden women with travel and related costs</li> <li>- Feasibility studies in settings without widely available ultrasonography</li> <li>- Studies on quality of ultrasound</li> </ul>

## 4.5 Global access

Global access is at the core of ISUOG's work, with a vision that every women in the world should have access to safe and quality ultrasound as part of their healthcare evaluation. Within the global health discourse, the 5AQ model is often used to define the factors that influence access: Availability, (geographic/physical) Accessibility, Affordability, Appropriateness, Acceptability and Quality. In relation to access to medical devices and imaging technology, the domains can be defined as in Table 10. These 6 domains were considered in the data collection and discussion of findings.

*Table 10 The definition of access. Adopted and adapted form: Increasing Access to Diagnostic Imaging in Developing Countries: The Asha Jyoti Mobile Clinic.(Shah et al., no date)*

Availability	A medical device is able to be purchased on the market. Also applies to functional medical devices that are physically available at health care facilities with competent staff to use them.
Affordability	Medical device is a cost-effective option for both the patient, the health care facility and health system.
Accessibility	Individuals are geographically within reach of health care facilities that house quality imaging services, do have the transport to go there and the services are physically accessible, also for people with disabilities.
Appropriateness	A medical device or imaging technology must be scientifically valid, address local need, and be utilized in a manner that a country can afford.
Acceptability	Refers to cultural beliefs and individuals' attitudes regarding the use of various medical devices and imaging modalities
Quality	Based on the national regulatory standards that are in place to assure safe and effective use of all health technologies

### 4.5.1 Results from qualitative data collection

#### **Respondents identify geographic accessibility and low awareness on need as some of the main barriers in access to ultrasound services**

According to survey respondents, the main barriers that women face in getting access to ultrasound services are that services are far away from their homes and that the importance or need for services is not recognized by women and their partners. This was approximately similar for all three case-study countries. Geographic distance, poor roads and transportation, were also the main barriers mentioned by key-informants that were interviewed, especially in big countries like Sudan and Oman. Other factors that were marked in the survey are that services are not available, too expensive or women do not consider the services of good quality (See Table 11) . Though survey respondents did not

indicate that cultural acceptability was a barrier in any of the three case-study countries, in an interview one of the outreach volunteers shared on experiences in Somaliland, also one of the previous training countries, where husbands were the ones to decide whether a woman could come for ultrasound or not. Another interview respondent also mentioned that due to cultural notions, it was difficult to do transvaginal US and other procedures that might be more sensitive in some cultures.

*Table 11 Answers to the survey question 'What are the main barriers women face when accessing ultrasound services in your country?' Multiple answers possible.*

ANSWER CHOICES	RESPONSES	
None of the above	0.00%	0
Services are not available	26.09%	6
Services are only available in the private sector	4.35%	1
Services are far away from their homes	78.26%	18
Women do not have time to go there	4.35%	1
Services are too expensive	34.78%	8
The services are culturally not accepted or considered inappropriate	0.00%	0
The importance/need for the services is not recognized by women and their partners/families	43.48%	10
Women do not find the services of good quality	26.09%	6
Other (please specify)	4.35%	1
Total Respondents: 23		

**Perception is that program has some (indirect) effect on availability, accessibility and quality of services, but there are no program monitoring data to support this**

Respondents felt that the program had at least some partial influence to availability of services (50% mentioned partial or positive influence on non-availability), geographic accessibility (59% mentioned partial or positive influence on services being far away) and quality perception (45% mentioned partial or positive influence on quality perception by women). Other possible barriers in access, such as appropriateness, affordability and acceptability were found to be less influenced. It must be emphasized that this is the perception of survey respondents. Program data did not monitor on access indicators.

**In order to further improve access, respondents suggest to continue (cascade) training and provide equipment support at the supply side, while improving (geographic) accessibility, understanding, and addressing enablers and barriers at the demand side**

To the question on what ISUOG outreach could do to help improving access of women to ultrasound (open question in survey and interviews), most survey respondents answered the need for (cascade) training of more professionals and equipment support. Some also considered the need to, beside the supply side, better consider the demand side and bring services closer to women. One of the ISUOG volunteers in Oman elaborated in an interview on how the media was involved there during their trip. There were articles in the newspaper and at national television informing the public on the program and the importance of ultrasound.

**Some quotes on how ISUOG could help improving access of women to Ultrasound:**

'By promoting collaboration with local partners and also with women who will benefit from such services. All the ISUOG outreach program activities are focused on healthcare providers. More strategies could be focused on understanding the enablers and barriers women face when they need an obstetric or gynecological ultrasound.' – survey respondent

'The ISUOG among activities to implement, should also emphasize on community sensitization, on the availability of the service provision in Obstetrics and Gynecology scanning.' – survey respondent

'ISUOG can partner with organisations that work with women in remote areas to enable them to access it's outreach activities. Continue training ultrasound providers in remote areas and provide them with support via virtual means (mentors) once they start working on ground.' – survey respondent

'Many of the things need to be tailored to the local situation. It should not be just a course, but a long-term plan. You are not going to change much with 3-4 visits, It should be implemented over the years, not just addressing training, but also addressing other problems, related to health literacy, cultural barriers, etc.' – interview with ISUOG outreach volunteer

#### 4.5.2 Lessons and best practices identified in the literature

The World Health Organization recommends one ultrasound scan before 24 weeks of gestation (early ultrasound) for pregnant women to estimate gestational age, improve detection of fetal anomalies and multiple pregnancies, reduce induction of labour for post-term pregnancy, and improve a woman's pregnancy experience (WHO, 2016). There is no evidence that ultrasound reduces maternal and perinatal mortality or health outcomes to support this recommendation. However, evidence does show that women are willing to be screened and tested for a variety of conditions, that they appreciate the knowledge and information they can get and that offering ultrasound services may lead to earlier ANC attendance, all if services are delivered in a caring and culturally sensitive manner (Downe *et al.*, 2016) (Ross *et al.*, 2014; Kim *et al.*, 2018).

However, globally and even nationally there are major inequalities. Various factors influencing accessibility, such as the need to pay or distances to facilities, make that in many resource-poor settings antenatal ultrasound is only available to a privileged few in urban centres (WHO, 2016; Luntsi *et al.*, 2021). While training & education of health care providers may contribute to wider availability of services with skilled providers and quality scans, other barriers to access remain and will perpetuate inequalities. In a scoping review on achieving universal access to obstetric ultrasound in resource constrained settings, Luntsi *et al.* describe the various challenges identified in the literature that need to be tackled, including illiteracy, poverty, inadequate requisite infrastructure, inadequate power and cultural beliefs or traditional norms that affect access (Luntsi *et al.*, 2021).

Various initiatives have taken place to bring services closer to the people, often combining training, the use of portable devices, task-sharing and telecommunication at the supply side and increasing community awareness and acceptability at the demand side (Ali *et al.*,



2015; Amoah *et al.*, 2016; Vinayak and Brownie, 2018; Wilson *et al.*, 2019; Luntsi *et al.*, 2021; Philips webinar, 2021). In Kenya, an ultrasonography team partnered with midwives through a task-sharing model that focused on skilling midwife sonographers with the capacity to accurately identify risk factors in pregnancy and increase Point-Of-Care Ultrasound (POCUS) access and specialist level clinical supervision through mobile phone transmission and teleradiology (Vinayak *et al.*, 2017b; Vinayak and Brownie, 2018). A similar type intervention in Mali resulted in improved medical diagnoses and patients' management on site leading to 25-70 USD savings for the patients as referral to the capital city was avoided. Also the services attracted more people to the facilities where increased attendance records were measured (Bagayoko *et al.*, 2014). In Ghana, a community-based project aimed to boost antenatal care attendance through equipping health workers with mobile phone applications and using portable ultrasound machines in the communities for women who cannot attend ANC at the facility. Images were sent in real-time to be analyzed by a gynaecologist in an urban hospital (Amoah *et al.*, 2016). In Uganda, Village Health Team (VHT) were successful in achieving community acceptance and increased utilization of ultrasound services in rural communities (Ali *et al.*, 2015). Most of these studies present no or little quality evidence on the effect to actual access for women or health outcomes. Currently in Kenya, the Mimba Yangu project led by Aga Khan University, aims to study feasibility, affordability, and sustainability of implementing the WHO's advice to have at least one ultrasound before 24 weeks gestation. The project involves remote education of midwives, real-time video collaboration and Community Health Workers (CHW) that start the conversation at household level and track pregnancies in an online app. The effect of the intervention is monitored on 17 health outcome indicators, ranging from quality of early identification and referral of at-risk pregnancies, utilization of antenatal care services, communication between health providers, patient satisfaction and birth preparedness, and acceptability of the referral set up by health workers and government stakeholders (Philips webinar, 2021),

Mhealth and telecommunication provide opportunity to track, exchange, consult and bring services closer to the people. Though of low-quality, evidence suggests that ultrasound images acquired in resource-limited settings and transmitted using a telemedical platform to an expert interpreter are of satisfactory quality and value for clinical diagnosis and management (Britton *et al.*, 2019). The development of Artificial Intelligence may in the near future assist non-specialized health workers to detect risk factors and arrange timely referral (van den Heuvel *et al.*, 2019).

#### 4.5.3 Considerations for the future

- In order to improve universal accessibility to safe quality ultrasound, in line with ISUOG's outreach strategy, program design should **consider a comprehensive approach that includes the study of and interventions that address access in all its aspects (5AQ)**.
- For this ISUOG can **improve collaboration with public health experts, community-based organizations with knowledge on and access to communities, and with universities or knowledge institutes** that can facilitate research for situational analysis and effectiveness studies.
- Design can **learn from previous and current initiatives that aim to bring services closer to the people, including task-sharing, telecommunication/AI and community involvement**, but evidence on what is effective needs to be strengthened.

## 4.6 Advocacy

Advocacy is one of the pillars of ISUOG outreach Theory of Change (ToC). Advocacy is an activity by an individual or group that aims to influence decisions within political, economic, and social systems and institutions. Health advocacy may take place at various levels (individual (patient) – community – institutions – policy systems) and often relates to activities that ensure access to care, navigate the system, mobilize resources, address health inequities, influence health policy and/or create health system change (Hubinette *et al.*, 2016).

ISUOG outreach aims to bring comprehensive and sustainable OBGYN ultrasound globally and provide global access to quality safe ultrasound; thus wants to convince stakeholders on the need for OBGYN ultrasound and education, address inequities in access, create sustainable health system change and mobilize resources to do so. This chapter further elaborates on this potential and on what is needed for effective advocacy.

### 4.6.1 Results from qualitative data collection

**Strong commitment felt from policy makers, but many more challenges need to be addressed in order to reduce inequities and achieve high quality care for all women**

A large majority of the survey respondents agreed (22%) or even strongly agreed (65%) that policy makers are committed to ensure access for safe and quality ultrasound. Also in interviews, key informants emphasized on the strong commitment they feel/have from local policy makers. While in some countries implementation and sustainability are challenged by the ongoing rotation of staff, in other countries the long-term sustainable partnerships with local institutions and government contributed to a successful training program. At the same time there is a realization that many more challenges need to be addressed in order to reduce inequities and achieve high quality care for all women.

**One of main issue that was felt to need improvement was the collection of data for effective advocacy.** In order to support the health narrative, knowledge and locally acquired data are needed on how ultrasound influences decisions and health outcomes. This could both support policy making and resource mobilization, as well as provide in communication to communities. Media were mentioned as important outlets for advocacy, including social media, website and conferences.

### 4.6.2 Lessons and best practices identified in the literature

The first look study found that adding antenatal screening US would not result in either major cost savings or major cost increases. But have higher training and maintenance costs. Their conclusion is that, given the lack of clinical effectiveness evidence and greater resource constraints of LMICs, it is unlikely that introducing antenatal screening US would be economically efficient in these settings (Bresnahan *et al.*, 2021).

Currently, the Mimba Yangu project in Kenya also studies the feasibility, affordability, and sustainability of implementing the WHO's advice to have at least one ultrasound before 24 weeks gestation. Policy makers want to know about clinical evidence and economic affordability. "This is even more critical in antenatal pregnancy screening, as it is known that it is hard to demonstrate the direct impact on maternal mortality. Therefore, secondary indicator evidence needs to be solid," Dr. Bashir M. Isaak, Head of the Department of Family Health at the Kenya Ministry of Health, said during a webinar in his response on the possibilities to include antenatal ultrasound screening in the basic package health insurance fund. "Next to clinical evidence, economic affordability is critical, especially in regions where many critical system improvements compete for scarce resources." (Philips webinar, 2021)

**Some quotes on how ISUOG should work to ensure awareness and policy change, in order to achieve universal health coverage for obstetric and gynaecological ultrasound:**

'ISUOG should promote high-quality research in low- and middle-income countries to highlight the importance of access to obstetric and gynecological ultrasound. For example, postpartum hemorrhage is the leading cause of maternal mortality worldwide, and ultrasound helps identify women at risk of hemorrhage (e.g., women with placenta previa, ectopic pregnancies, multiple gestations, etc.). By promoting research and evaluating such potential outcomes in underserved populations, local policymakers and ISUOG will benefit from analyzing valuable data. Furthermore, they could advocate for the improvement of maternal, fetal, and neonatal health.' – survey respondent

'It has been a privilege that during the 3,5 years the program was run the majority of people in charge at the ministry of health remained involved. Also at the hospital where the program was executed we always dealt with the same head of department. The continuous commitment of these people was important for the success of the program.' – survey respondent

'I think this should be a leading mission for ISUOG to advocate on behalf of women for better access to health it should be brought up at every opportunity – at ISUOG meetings, on the website, when requests are made for US OR and BT training' – survey respondent

#### 4.6.3 Considerations for the future

- Continue to **invest in long-term sustainable partnerships with local institutions and governments**, as well as other women's health organisations that can contribute to holistic programming.
- Policy makers are committed to ensure access for safe and quality ultrasound, but **data is needed on how ultrasound influences decisions and health outcomes**. This could further strengthen local awareness and induce resource mobilization. ISUOG could work with partners to design comprehensive interventions and monitor on what works, how, for whom and for what (type of health outcomes).
- **Data on long-term effects of the training program can be used to advocate for effectiveness of the training** and should be used alongside data that prove effect of simultaneous interventions in comprehensive programming.

## 5 Discussion and Conclusion

The ISUOG outreach program brings obstetric and gynaecology ultrasound education to lower resourced settings since 2008. As the organization is growing and within a fast changing world, especially for imaging technologies, the program ambitions have shifted from the somewhat vertical training approach to a more comprehensive approach to meet ISUOG's vision that every woman should undergo a safe and patient-centred quality ultrasound (US) as part of their healthcare evaluation. The current assessment served to inform ISUOG outreach on its current impact and opportunities in its future strategies.

Qualitative perspectives from professionals that had been involved in the program, together with evidence from the global literature, confirmed the need to further invest in training and health systems, alongside interventions that address access for patients. ISUOG has a strong comparative advantage with an enormous network of professionals with technical expertise on imaging and well-developed training curricula. The outreach program seemed to be well established with clear evidence for its direct effects on knowledge and skills-building of the trainees, as deduced from pre-post test results and triangulated with the qualitative responses of this evaluation. The program adopts a compelling evidence-based curriculum and is taught by competent outreach trainers. Respondents in this evaluation expressed positive impact of the program on the quality and practices of the trainees. Besides technical content, the curriculum also taught organisational and soft skills, such as patient-communication and teaching.

Longer term effects of the training were dependent on factors such as the follow-up and mentoring, the commitment of trainees, availability of good quality machines, employers support, availability of time and collaboration of the local authorities. Many of these factors are health system related. Qualitative data collected confirmed the available literature on the importance of a well-functioning health system for the successful implementation of ultrasound services. This was felt as well through the successes of the program in Oman, where the health system was already at a relative good shape when the program started. Oman has a good antenatal care and referral system, as well as an electronic database system. These were thought to be some of the contributing factors to the relative success of the program in Oman, compared to the other countries. A strong health system will help to overcome the accessibility challenges that women face in reaching and receiving good quality services. Health system and community interventions may improve physical availability, referral systems, acceptable, affordable & quality services, health literacy, and health seeking behaviour.

Planning for the development of sustainable ultrasound services need to take local contexts in account and involve national experts and educational institutions. Curricula need to be flexible to accommodate specific national needs and contexts. Country assessment during the planning phase should include a health system wide analysis. Besides that, investments should be made in health system strengthening interventions such as national capacity building activities, consultations for integration of the training in national training programs, national guidelines and regulation of services, referral systems, monitoring information systems, digital health and tele-radiology applications, and pooling needed funds for infrastructure and availability of machines. This can be achieved through strategic partnerships with relevant national institutions and international organisations.

Retention of knowledge and skills was reported to be relatively good. Respondents mainly relied on self-learning and the WhatsApp group. Due to their busy schedules practitioners could not follow up with the available online materials and courses. The virtual mentorship program also did not reach its goals. WhatsApp on the other hand offered a lay mode for communication, as mobiles are widely available and accessible. The WhatsApp groups provided a platform for sharing images, cases, and

requesting consultations between trainees and the outreach program volunteers. We see opportunities to harness such interaction on WhatsApp or similar platforms. The literature also provides multiple examples of how digital health could leverage training, services delivery and access.

To further support retention of knowledge and ongoing quality assurance, trainees accessibility to the online library of resources should be improved. Cheaper packages could be offered for lower-resourced settings and incentives for involvement can be linked to the mandatory requirement of local accreditation/certification needs and quality assurance mechanisms, especially when nationally adapted content is offered. Local governance to regulate services and assure quality should be on the agenda of every nation that aims to leverage ultrasound services in-country.

Respondents also recommended refresher national courses, and organisation of scientific meetings and workshops that allow exchange of knowledge and case studies without having to wait for international meetings that might not be accessible to participants from low and middle income countries. Simultaneously, improving access and involvement of participants from low and middle income countries to the international society congress can be a good chance for exposure and learning. One way to do that is to organise the congress in different countries and regions, including low and middle income countries. The launch of national societies like the Omani society are another example on how knowledge and expertise can be decentralised and national teams can take more leadership in continuous learning.

Cascading knowledge is one of the main aims of the program. Outstanding trainees were selected as trainers or potential trainers in next phases. The program seemed to be fulfilling this rule, however, due to multiple contextual factors (e.g. the covid-19 pandemic or the coup in Sudan) not many countries reached phase 2 so far. Other modes for sharing knowledge were peer to peer informal learning, mentorship, and coaching. Although it is difficult to ensure the quality of such knowledge exchange, providing trainees with the skills needed for sharing knowledge and skills like communication, teaching, and presentation skills remains important.

ISUOG can play a role in the integration of curriculum elements in the national training programs, and in providing technical assistance and capacity building to the national governments. The training is relevant for young doctors, and doctors in speciality training, for Obstetrics and Gynaecology, as well as for radiologists, and primary care providers. While some countries' policies do not allow them to perform US, other cadres could be engaged like nurses, and midwives. The literature presents multiple examples of how lower cadre health workers can be crucial in identifying risk factors at the primary level. Apart from assuring quality control, regulating authorities should define who provides US services and for what indications. The current ISUOG program focuses on specialist training, but may adopt multiple forms depending on the local needs and health system. The effectiveness and efficiency of task-shifting should be further studied and may be used in advocacy on the role of ultrasound and achieving universal health access. Full integration and national ownership of the program will ensure its sustainability and longer term impact.

Accreditation of the curriculum was a widely discussed challenge within ISUOG. Members realise the importance of accreditation to ensure quality. At the same time there is the concern that having followed the accredited training would provide any trainee, independent of its qualifications, with indefinite authority to perform services, even without ongoing quality assurance, which may potentially lead to misuse or even abuse. Options to establish accreditation include the use of degree certificates with relevant competencies gained based on end of training assessment, collaborations with international educational institutions who provide quality assurance of the curriculum and assessment tools, and collaboration with the national authorities to integrate a qualification and continuous medical education system that ensures the quality of both practitioners and service provisions locations.

Monitoring and evaluation was identified as another challenge for US educational programs. It is difficult to measure longer term impact of knowledge and skills acquired. However, it is essential to have a robust system in place to not only monitor knowledge, and skills, but also their application.

This can also be done in collaboration with the national authorities who are expected to develop guidelines and monitor the performance of health care provision in both public and private sectors. Continuous quality improvement, and proper supervision and use of locally adapted guidelines can allow better control over the quality of the services and prevent misuse and protect patients from harm.

Availability of reliable data is also essential for decision making, resources mobilisation, and advocacy. Media, including social media and online content, can play beneficial in data dissemination, communication, and advocacy.

Good quality machines were not always available, especially in rural and remote areas, and in primary care level. Even when machines are available, cleaning and maintenance were sometimes a problem. The private sector often has better availability of machines, but lacks the qualified personnel. Partnerships with the private sector are therefore essential to leverage availability. Many staff work both in public and private sector (mainly to improve their income). This is already an area where public private partnerships can play a role.

In collaboration with national institutions the program could ensure the availability of machines during the training via agreements with sponsor providers. After the training some participants decided to invest in buying the machines for their own private practice from the company that provided its machines for the training. This can be a good case to share with sponsors and funders of the program who might find it a good business case to market their machines to practitioners.

At the same time, some participants who had learnt a new skill and were able to do US scans on their own, were able to increase their income through performing more tasks in the private sector. This can be empowering, especially for women as indicated by one respondent. Literature also showed similar interventions who use US as an income generating tool for women in poor settings. However, such interventions and outcome should be considered with caution, as it can be on expense of the quality of the service and the client's accessibility to the services. For profit sector was reported in both literature and the evaluation to be more prone to misuse and overuse of the US to gain more profit. Some women who can afford and perceived extra scans to equal better care, were willing to pay extra in the private sector. Some literature argue that private sector in that sense was reducing the burden of the public sector who can then focus on providing the needed services to the poorer.

## 6 Recommendations

The chapters on training & education, health systems strengthening, global access and advocacy all had its considerations for the future as a result form the gathered data in this assessment. The following overall recommendations should assist ISUOG in moving towards a more comprehensive programming.

1. In order to work towards ISUOG's outreach vision and advocate with donors and policy makers on the need for training and access to ultrasound services, effective strategies need to be developed with evidence-generation of their success. A global theory of change with strategies for effective ultrasound implementation should address training, health system factors and universal access (5AQ).
2. ISUOG outreach can promote its comparative advantage with its technical expertise on imaging and well-developed training curricula, and seek for programmatic partners with expertise on other domains. Partners should have expertise on, but not limited to, public & community health, research, medical education, health system management and governance. Stakeholder mappings should be conducted globally and locally to identify the needed partners to achieve identified results.
3. ISUOG outreach should develop indicators for country selection that include health indicators and health system factors and could also consider political will and governance structure.
4. Programs should take local contexts in account and be designed based on locally identified relevance and needs, both for training, as well as for other strategies that improve access to US services. The needs assessment should adopt a wider health system and access lens.
5. Following country selection, needs assessment and identification of required partners, a locally adapted theory of change can be developed together with local partners; starting with the impact level goals and then work backwards on what is needed to achieve those in terms of training, health system strengthening and improving access.
6. A logframe approach will clarify the steps from intervention to result and clearly set indicators at output, outcome and impact level will have to be monitored throughout. Indicators should include training, service delivery, access and health outcome indicators.
7. Based on the findings in this assessment specific elements that should be considered are outlined in the considerations for the future for each sphere of interest.



## Overview of considerations for the future from each section

<p><b>Training &amp; education</b></p> <ul style="list-style-type: none"> <li>• The current methodologies and train the trainer approach seem to be effective. However, attention should be given to a clear and standardised monitoring system for the training and knowledge retention.</li> <li>• Content of the current curriculum seems to be effective and consists of highly expertise knowledge. However, more attention can be given to the contextualization and adaptation to local relevance and needs.</li> <li>• The curricular elements could adopt a system for accreditation and certification that meets the needs of respondents and local stakeholders. Simultaneously ISUOG could work with local authorities on the governance system to regulate services and assure quality.</li> <li>• Retention of knowledge and skills is essential. ISUOG can further contribute by ensuring the accessibility to resources for self-study, provision of national workshops and refresher trainings. Motivation for participation can be linked to the required accreditation and local quality assurance mechanisms.</li> <li>• Adoption of lay tools for direct communication such as WhatsApp facilitates sharing knowledge and consultations. Other initiatives like the virtual mentorship program might need to be reassessed.</li> <li>• Sharing knowledge should continue to be encouraged, not only through formal trainings, but also through peer to peer and via regular scientific meetings.</li> <li>• Contextual factors should be taken into consideration when planning and implementing the outreach program. This includes also health system factors that will be discussed in the next section.</li> </ul>	<p><b>Health Systems Strengthening</b></p> <ul style="list-style-type: none"> <li>• The Needs assessment prior to the project can adopt a wider health systems lens and identify health system interventions needed in order to establish appropriate ultrasound delivery systems. These could be taken along in comprehensive programming with partners.</li> <li>• Apart from training, effective programming for US should address equipment barriers, task-sharing/shifting, referral strengthening and other health system interventions.</li> <li>• Programs should be tailored to local (education &amp; health system) needs.</li> <li>• The curriculum could expand on governance, organisation, and other non-technical skills that contribute to capacity building of national staff. The program could also address capacity building and system wide issues regarding quality assurance and image archiving.</li> <li>• ISUOG could engage with national stakeholders like the government, educational institutions, public health experts and health system partners to design and implement comprehensive programming.</li> <li>• Involvement of the national society members, trainers, and trainees in the program planning and execution can contribute to capacity building and might open the door for other health system initiatives.</li> <li>• Monitoring should include service delivery measurement that gives an overview on the impact of the program. This can also allow the identification of priority impact areas.</li> <li>• The program should explore the potential for applications of digital Health in training and service provision.</li> </ul>
<p><b>Global access</b></p> <ul style="list-style-type: none"> <li>• In order to improve universal accessibility to safe quality ultrasound, in line with ISUOG's outreach strategy, program design should consider a comprehensive approach that includes the study of and interventions that address access in all its aspects (5AQ).</li> <li>• For this ISUOG can improve collaboration with public health experts, community-based organizations with knowledge on and access to communities, and with universities or knowledge institutes that can facilitate research for situational analysis and effectiveness studies.</li> <li>• Design can learn from previous and current initiatives that aim to bring services closer to the people, including task-sharing, telecommunication/AI and community involvement, but evidence on what is effective needs to be strengthened.</li> </ul>	<p><b>Advocacy</b></p> <ul style="list-style-type: none"> <li>• Continue to invest in long-term sustainable partnerships with local institutions and governments, as well as other women's health organisations that can contribute to holistic programming.</li> <li>• Policy makers are committed to ensure access for safe and quality ultrasound, but data is needed on how ultrasound influences decisions and health outcomes. This could further strengthen local awareness and induce resource mobilization. ISUOG could work with partners to design comprehensive interventions and monitor on what works, how, for whom and for what (type of health outcomes).</li> <li>• Data on long-term effects of the training program can be used to advocate for effectiveness of the training and should be used alongside data that prove effect of simultaneous interventions in comprehensive programming.</li> </ul>



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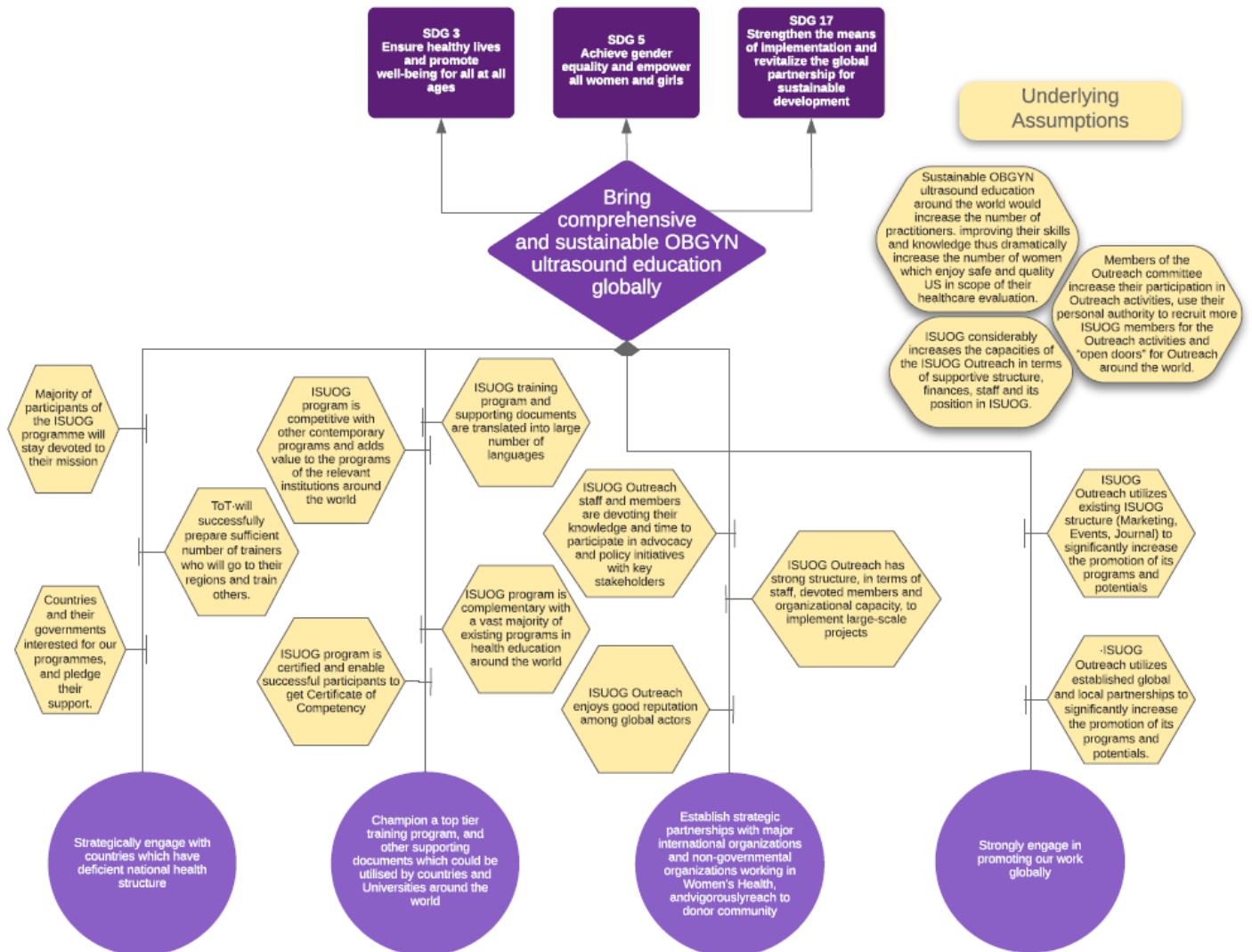
# Annexes

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# Annex 1 ISUOG Outreach ToC

February 2020

## ISUOG OUTREACH THEORY OF CHANGE



## Annex 2 Training components

In Oman phase 1 the following presentations were completed, alongside the given number of hours of practical training (source: Oman-Phase 1 – final report):

### Trip I: 5th – 9th November 2017

***Amount of hands-on-training: 13 hours, 40 minutes***

---

Physical principles of ultrasound including safety

---

Transducers image production, knobology and scanning planes

---

Fetal Biometry

---

Introduction scanning skills

---

Informed consent image recording/report writing

---

Normal early pregnancy

---

Abnormal early pregnancy, miscarriage, molar, retained products, ectopic and pull

---

1st Trimester normal and abnormal fetal anatomy

---

2nd and 3rd fetal anatomy normal and ab-normal

---

Amniotic fluid assessment

---

Placenta assessment

---

Multiple pregnancy 1st and 2nd trimester

---

Fetal growth assessment

---

Ectopic pregnancies and pregnancies of unknown location

---

Gynecology relating to pregnancy

---

Triage in the 1<sup>st</sup> trimester

---

Triage in 2nd and 3rd trimester

---

### Trip II: 8<sup>th</sup> – 12<sup>th</sup> April 2018

***Amount of hands-on-training: 13 hours, 40 minutes***

---

Doppler Technique

---

Monitoring growth in singletons and twins

---

Ultrasound examination of the uterus and ovaries normal

---

The 20-planes approach to the routine mid-trimester scan

---

Evaluating fetal anatomy from longitudinal sections

---

Distinguishing between normal and abnormal appearances of the skull and brain

---

Examine upper lip face and profile

---

Assessing the neck and the chest

---

Obtaining and interpreting the heart correctly

---

Examining abdomen and anterior abdominal wall

---

Ultrasound examination of the uterus and ova-ries abnormal

---

Report writing in gyne ultrasound

---

Assessment of the fetal urinal tract

Assessment of long bones and extremities

Making a decision

**Trip III: 12<sup>th</sup> – 18<sup>th</sup> November 2018**

***Amount of hands-on-training: 13 hours , 30 minutes***

Twin pregnancies

Physics of Doppler

Twin case presentation

Doppler in obstetrics

Ectopic Pregnancy

Placenta Previa

Cervical Assessment

Ultrasound in labour

Gynaecological ultrasound the basics

Examining the uterus; myometrium

Typical us appearances of common pathologies in the adnexa

Maternal Mortality how can ultrasound help

Quality control processes for operator and programs

## Annex 3 Waiver for full ethical review



**KIT** Royal  
Tropical  
Institute

### RESEARCH ETHICS COMMITTEE

Contact: Meta Willems (secretary REC)  
Telephone +31 (0)20 568 8514  
m.willems@kit.nl

To:  
Irene de Vries, MD, MA  
Maternal newborn health advisor, KIT  
By email: <i.d.vries@kit.nl>  
Cc: Mahdi Abdelwahab, Barend Gerretsen

*Amsterdam, 18 June 2021*

**Subject** Decision Research Ethics Committee regarding a waiver for a "study on the outreach program of the international Society of Ultrasound in Obstetrics and Gynaecology (ISUOG)" (S-156)

Dear Irene de Vries,

The Research Ethics of the Royal Tropical Institute (REC) has reviewed your application for a waiver for the "study on the outreach program of the international Society of Ultrasound in Obstetrics and Gynaecology (ISUOG)" (S-156) which was submitted on 15 June 2021.

The study takes place in in the international field with specific case studies in Oman, Sudan and Rwanda. The purpose of the study is to review the outreach programme of ISUOG and identify the opportunities and needs to further strengthen its impact for global access to safe and patient-centred quality ultrasound. The study focuses on stakeholders involved in the program, including program managers, implementing partners and training of trainers. The study results will be used for scaling-up and strengthening ISUOG outreach.

The study consists of a literature review, (online) qualitative interviews and a survey. The number of respondents is 18 for qualitative interviews and approximately 50 for the survey (convenient sampling). Respondents will be selected through the databases of ISUOG outreach.

The study team consists of Irene de Vries and Mahdi Abdelwahab with quality assurance by Barend Gerretsen.

The study is exempted from full ethical review based on the following reasons:

- a. the participants will be involved in their professional capacity only; the issues to be covered in the topic list cover information related to the duties of the respondents and information in the public domain; questions related to any personal questions are not included;
- b. the participants will be asked informed consent before the data collection to make sure participation is voluntary and participants are informed that they can decide to decline or withdraw from the interview at any moment without any effect on reputation, or other consequences;
- c. participating in this study does not foresee any physical, psychological and/or socio-economical risk or discomfort;

The Netherlands  
Fax +31 (0)20 568 8444

ABN AMRO 40 50 05 970  
ABN AMRO USD 62 62 48 183

*Royal Tropical Institute*



- d. all information will be derived, processed, stored and published anonymously.

The Committee grants this waiver provided that you inform the KIT GDPR project officer about your research for GDPR monitoring purposes.

The Committee requests you to inform the REC once substantive changes to the protocol are made, important changes to the research team take place or researchers are added to the research team.

Moreover, the Committee requests you to send the final report of the research containing a summary of the study's findings and conclusions to the Committee, for research monitoring purposes.

Please note that in case the final report is not submitted to the REC, or GDPR measurements are not taken care of sufficiently, this may have consequences for review of your next research proposal.

Wishing you success with the research,



Pam Baatsen, MA  
Chair of the KIT REC

## Annex 4 Questionnaire for online survey

### Welcome

The International Society of Ultrasound in Obstetrics and Gynaecology (ISUOG) is in the process of reassessing its outreach program and identifying the needs to further strengthen its impact for global

access to safe and patient-centred quality ultrasound. You have been involved in the program and therefore your perspectives and suggestions for further improvement will be highly appreciated. In this survey respondents are asked to provide their (professional) perspectives on the successes and challenges of the programme and the contexts it operates in. Questions that will be asked are based on 4 themes: training & education, health systems strengthening, global access and advocacy. The estimate time to complete the survey is 15 minutes.

Your participation is entirely on a voluntary basis and your information will be kept confidential. You are free to stop the survey at any point in time or not to answer a particular question. Withdrawing from the survey will not in any way affect your reputation, relations or have any other consequence. Your professional expertise and insights will be highly valued. Results of the assessment will help ISUOG (and partners) to further improve and scale up the programme. We value your honest response.

Themes		Questions	Type	Proposed answers
<b>General background information</b>	1	In which country have you been involved in the ISUOG outreach program? (Questions in this survey are context – specific; If you work in multiple countries select the country that you know best. All further questions can be answered with the here selected country in mind)	Multiple choice (single option)	<ul style="list-style-type: none"> <li>- Oman,</li> <li>- Rwanda,</li> <li>- Sudan,</li> <li>Other, specify</li> </ul>
	2	Gender?	Multiple choice (single option)	<ul style="list-style-type: none"> <li>- Female,</li> <li>- Male,</li> <li>- Prefer to no answer</li> <li>Other</li> </ul>
	3	Professional background?	Multiple choice (multiple can apply)	<ul style="list-style-type: none"> <li>- Gynaecologist/Obstetrician,</li> <li>- General practitioner,</li> <li>- Nurse,</li> <li>- Midwife</li> <li>- radiologist/ultrasonographer,</li> <li>other, specify...</li> </ul>
	4	What level of health care do you provide?	Multiple choice (multiple can apply)	<ul style="list-style-type: none"> <li>- primary</li> <li>- secondary</li> <li>- tertiary</li> <li>- private</li> <li>other, specify...</li> </ul>
	5	Why did you join the program?	Multiple choice	<ul style="list-style-type: none"> <li>- I was selected by my employer,</li> <li>- I was excited about the mission,</li> <li>- I identified the need for such a program,</li> <li>- to learn something new,</li> <li>- to improve women access to US,</li> <li>- I had no other choice</li> <li>- other</li> </ul>

	6	In which capacity were you involved with ISUOG Outreach?	Multiple choice (multiple can apply)	<ul style="list-style-type: none"> <li>- Outreach volunteer (<i>further directed to question 19</i>)</li> <li>- Trainee (<i>further directed to question 11</i>)</li> <li>- Trainee selected as a trainer of trainers (<i>further directed to question 7</i>)</li> <li>- Involved in local project coordination (<i>further directed to question 19</i>)</li> <li>- Public sector (inclusive NGO or government) (<i>further directed to question 19</i>)</li> <li>- Policymaker (<i>further directed to question 19</i>)</li> </ul> <p>Other, specify...(further directed to question 19)</p>
Training and education	7	(Only for TOT participants) When did you finish your training by ISUOG?	Multiple choice (single option)	<ul style="list-style-type: none"> <li>- &lt; 1 year ago</li> <li>- Between 1-2 years ago</li> <li>- Between 2-5 years ago</li> <li>- More than 5 years ago</li> </ul>
	8	(Only for TOT participants) As a result of the training, do you feel confident to train others?	Multiple choice (single option)	<ul style="list-style-type: none"> <li>- Very confident,</li> <li>- somehow confident,</li> <li>- I do not know,</li> <li>- Not confident</li> </ul>
	9	(Only for TOT participants) Have you been able to further roll out/train others?	Multiple choice (single option)	<ul style="list-style-type: none"> <li>- Yes I did,</li> <li>- No, I did not but it is planned,</li> <li>- No, I did not and it is not planned yet</li> <li>- Other</li> </ul>
	10	(Only for TOT participants) If yes, How many people have you trained	multiple choice (single option)	<ul style="list-style-type: none"> <li>- 0-10,</li> <li>- 10-20,</li> <li>- 20-50,</li> <li>- &gt;50</li> </ul>
	11	(For all trainees) What are the effects of the training on your daily practice? You can choose more than one answer	Multiple choice (multiple can apply)	<ul style="list-style-type: none"> <li>- It had no impact on my practice,</li> <li>- I diagnose more cases that I would miss before,</li> <li>- the quality of the scans I make has improved,</li> <li>- my communication with the patients has improved,</li> <li>- I have increased the number of scans,</li> <li>- During work, I have been able to share my gained knowledge with others</li> </ul>
	12	(For all trainees) What are the factors that allow you to apply your acquired skills and knowledge? You can choose more than one answer	Multiple choice (multiple can apply)	<ul style="list-style-type: none"> <li>- Support of our employer,</li> <li>- collaborative colleagues,</li> <li>- good infrastructure,</li> <li>- time available,</li> <li>- continuous training,</li> <li>- mentoring from ISUOG outreach team,</li> <li>- available equipment,</li> <li>- none of the above,</li> <li>- other, specify...</li> </ul>

	13	(For all trainees) What are the barriers to applying your acquired skills and knowledge	Multiple choice (multiple can apply)	<ul style="list-style-type: none"> <li>- The training is not well adapted to the national context,</li> <li>- training materials are not available in local language,</li> <li>- no working equipment,</li> <li>- not able to maintain my skills,</li> <li>- lack of support from my employer,</li> <li>- too busy schedule/no time,</li> <li>- women refusal/cultural resistance,</li> <li>- none of the above,</li> <li>- other, specify...</li> </ul>
	14	Were there any barriers from ISUOG outreach?	Multiple choice (single option)	<ul style="list-style-type: none"> <li>- Yes, Comment....</li> <li>- No</li> </ul>
	15	To what extent have you been able to sustain the acquired knowledge/skills.	Multiple choice (single option)	<ul style="list-style-type: none"> <li>- I was able to sustain all acquired knowledge/skills,</li> <li>- I was able to sustain some knowledge/ skills,</li> <li>- I could not sustain any.</li> </ul>
	16	How have you been able to sustain the quality of skills & knowledge? You can choose more than one answer	Multiple choice (multiple can apply)	<ul style="list-style-type: none"> <li>- I did follow-up trainings,</li> <li>- peer-to-peer quality control &amp; feedback with my colleagues,</li> <li>- I have coach/ Mentoring,</li> <li>- I consult with international trainers,</li> <li>- Self-learning,</li> <li>- I attend scientific meetings,</li> <li>- I have acquired CME-credits for US</li> <li>- None of the above</li> <li>- Other, specify...</li> </ul>
	17	Since the training, have you been able to share your knowledge with others?	Multiple choice (multiple can apply)	<ul style="list-style-type: none"> <li>- yes through formal training,</li> <li>- yes through informal peer-to-peer,</li> <li>- Yes, through mentoring/coaching,</li> <li>- yes through scientific meetings,</li> <li>- I was not able to share my knowledge</li> </ul>
	18	What challenges did you face while sharing your knowledge?	Multiple choice (multiple can apply)	<ul style="list-style-type: none"> <li>- I am too busy and have no time,</li> <li>- We do not have the infrastructure in the workplace,</li> <li>- I do not have the skills to teach others,</li> <li>- the training materials are complicated/ not in the local language,</li> <li>- other reasons, specify.....</li> </ul>

	19	To what extent does the ISUOG training and curriculum provide an added value to the national practitioners?	Multiple choice (single option)	<ul style="list-style-type: none"> <li>- There is a big need for the program;</li> <li>- It fills a gap that no other programs are addressing;</li> <li>- It partially overlaps with other programs in the country,</li> <li>- There is no need for the program;</li> </ul>
	20	How should longer term quality of skills and knowledge be sustained?	Multiple choice (multiple can apply)	<ul style="list-style-type: none"> <li>- Refresher trainings,</li> <li>- peer-to-peer quality control &amp; feedback,</li> <li>- coaching &amp; Mentoring,</li> <li>- accreditation and CME credits,</li> <li>- provide resources for self-learning,</li> <li>- organise scientific meetings,</li> <li>- other, specify....</li> </ul>
	21	There are enough resources and materials in local languages that I can use in my trainings.	Multiple choice (single option)	<ul style="list-style-type: none"> <li>- Strongly agree/</li> <li>- Agree/</li> <li>- Neutral/</li> <li>- Disagree/</li> <li>- Strongly disagree</li> </ul>
	22	To what extent is US training incorporated in national training curricula.	Multiple choice (single option)	<ul style="list-style-type: none"> <li>- Fully incorporated,</li> <li>- partially incorporated,</li> <li>- not incorporated at all,</li> <li>- not able to judge.</li> </ul> <p>Add specification for which curricula</p>
Health systems strengthening	23	What do you see as the main challenges in your national health system when it comes to the implementation of obstetric and gynaecology US?	Multiple Choice (multiple can apply)	<ul style="list-style-type: none"> <li>- Shortage of human resources,</li> <li>- shortage of equipment,</li> <li>- maintenance of equipment,</li> <li>- lack of training,</li> <li>- lack of monitoring and quality assurance,</li> <li>- poor information management system,</li> <li>- poor referral mechanisms,</li> <li>- inappropriate use (overuse/misuse), specify</li> <li>- the importance/need is not recognized by the policy makers</li> </ul> <p>other, specify</p>
	24	To what extent has the ISUOG outreach program been able to (directly or indirectly) positively influence these challenges/barriers?	A grid multiple choice	<p>Very positive influence, partial influence addressing, no influence, I do not know, NA, with each of the following:</p> <ul style="list-style-type: none"> <li>- Shortage of human resources,</li> <li>- shortage of equipment,</li> <li>- maintenance of equipment,</li> <li>- lack of training,</li> <li>- lack of monitoring and quality assurance,</li> </ul>

				<ul style="list-style-type: none"> <li>- poor information management system,</li> <li>- poor referral mechanisms,</li> <li>- inappropriate use (overuse/misuse)</li> </ul> <p>the importance/need is not recognized by the policy makers</p>
	25	How do you find collaboration and support from national bodies and government in the implementation of obstetric and gynaecological ultrasound?	Multiple Choice (single option)	<ul style="list-style-type: none"> <li>- The national bodies are very supportive and facilitate our work,</li> <li>- The national bodies are somehow supportive,</li> <li>- Not supportive,</li> <li>- Blocking our work</li> </ul>
	26	What are the top priorities for health system strengthening to implement safe and quality obstetric US, and how could they, in your opinion, best be addressed?	Open question	
	27	How can ISUOG address such priorities?	Open question	
Global access	28	What are the main problems women face when accessing US services in your country?	Multiple Choice (multiple can apply)	<ul style="list-style-type: none"> <li>- services are not available</li> <li>- services are only available in the private sector</li> <li>- Services are far away from their homes</li> <li>- Women do not have time to go there</li> <li>- services are too expensive</li> <li>- the services are culturally not accepted or considered inappropriate</li> <li>- the importance/need for the services is not recognized by women and their partners</li> <li>- Women do not find the services of good quality</li> <li>- Other, specify....</li> </ul>
	29	To what extent has the ISUOG outreach program been able to (either directly or indirectly) positively influence these challenges/barriers in your country?	A grid multiple choice	<p>Very positive influence, partial influence addressing, no influence, I do not know, NA, for each of the following:</p> <ul style="list-style-type: none"> <li>- (services are not available</li> <li>- services are only available in the private sector</li> <li>- Services are far away from their homes</li> <li>- Women do not have time to go there</li> <li>- services are too expensive</li> <li>- the services are culturally not accepted or considered inappropriate</li> <li>- the importance/need for the services is not recognized by women and their partners</li> </ul>

				- Women do not find the services of good quality)
	30	Explain how can the ISUOG outreach program help improving access of women to US	Open question	
Advocacy	31	Policymakers are committed to make US part of their UHC agenda.	Multiple Choice (single option)	- Strongly agree/ - Agree/ - Neutral/ - Disagree/ - Strongly disagree
	32	What do you think that ISUOG should work on to ensure awareness and policy change, in order to achieve universal health coverage for obstetric and gynaecological ultrasound?	Open question	
Cross-cutting	33	I am committed to working with the program for the next phases	Multiple Choice (single option)	- Strongly agree/ - Agree/ - Neutral/ - Disagree/ Strongly disagree,
	34	I would recommend the program to other colleagues. Why?	Multiple Choice (single option)	- Strongly agree/ - Agree/ - Neutral/ - Disagree/ - Strongly disagree,
	35	What are your recommendations to strengthen the program and ensure its impact?	Open question	-
	36	Any other comments you would like to make	Open question	

## Annex 5 Topic guide for key-informant interviews

Please note, that this is a topic **GUIDE** and will be used as such, meaning that the questions proposed provide guidance only and that it will be important to adapt the questions during the interviews in such a way that they make sense to the respondents.

Prior to the interview informed consent will be arranged by using the informed consent form. The information sheet will be shared with the interviewee in advance. There will be space for questions at the start of the interview. Due to the nature of the assignment (interviewees sharing information from their professional perspective) and the online moderation, (recorded) oral consent will be suffice.

Themes	Questions	Probe for
<b>Training and education</b>	Could you elaborate on your experiences with the trainings of ISUOG outreach?	What happened during training? What happened afterwards?
	and its longer lasting effects?	Contribution of the ISUOG outreach program to national capacity (skills & knowledge), Examples of how the acquired knowledge is currently used & sustained and how this has influenced quality of care?
	How are acquired skills maintained (during the program and afterwards)	Feedback & quality control, accreditation (systems) & CME credits
	and/or what is needed to sustain acquired skills & knowledge?	
	To what extent is US training incorporated in national training curricula or activities by other stakeholders to improve MNCH?	
<b>Health systems strengthening</b>	and/or what is your vision for this?	
	What are the main challenges in your national health system when it comes to the implementation of obstetric and gynaecological ultrasound? (e.g. to meet WHO recommendation of one ultrasound (US) scan before 24 weeks gestation to estimate gestational age (GA), improve detection of fetal anomalies and multiple pregnancies, reduce induction of labour for post-term pregnancy, and improve a woman's pregnancy experience).	Human resources, equipment & maintenance, costs for implementation (incl. costs for training/schooling, infrastructure, costs for patients), public/private sector, data/information management, overuse/misuse (code of conduct), referral pathways (and the moral implications – is performing an US always linked to the ability of providing appropriate intervention), quality of care, governance & accountability
	To what extent has the ISUOG outreach program been able to (directly or indirectly) address (some of) these challenges?	
	What are top priorities for health system strengthening to implement safe and quality obstetric and gynaecological US and how could they, in your opinion, best be addressed?	
<b>Global access</b>	Could you tell us something about access for women to obstetric and gynaecological US in your country?	Who has access? Who not? Who pays for services? health insurance funds/packages, public/private sector, cultural perception, barriers & enablers
	To what extent has the ISUOG outreach program been able to (directly or indirectly) address (some of) these challenges?	
	What are major barriers that need to be tackled to improve access?	Consider availability, accessibility, affordability, acceptability, appropriateness and quality



<b>Advocacy</b>	To what extent are policy makers committed to make US part of their UHC agenda?	
	What is needed for effective advocacy?	Data, knowledge, partnerships/relationships
<b>Cross-cutting</b>	If you would have to give advice to ISUOG on how they can further strengthen their impact to ensure global access for safe and patient-centred quality ultrasound, what would it be?	Address supply and demand side, health system factors, accessibility factors, advocacy
	Who are partners needed to be involved?	Global and local, policy level, provider level, community/grass-root

## Annex 6 Country case-studies

# Case study – Sudan

## Training 28 trainees in Sudan for phase 1

In November 2016 ISUOG Outreach, in partnership with the state Ministry of Health, North Khordofan University, the Sudanese Family Planning Association and SALMAT NGO, launched the outreach training program in El Obeid, North Khordofan. Over the space of two years 28 trainees were trained in three training sessions for phase 1<sup>14</sup>. Seven trainees were selected to become trainers for phase 2. However, after a coup in Sudan, the program was brought to a halt and is still awaiting the start of phase 2.

## Limited indicators and monitoring data available to assess results

No raw monitoring data were available for the research team to re-evaluate the programs output<sup>15</sup> or outcome<sup>16</sup>. According to the synthesis of monitoring data there was an increase of 17% at post-test (day 5) compared to pre-test (day 1) during the third trip, while retention of knowledge between trip 2 and 3 was 82%.<sup>1</sup>

## Positive perceptions of the program and its effects on quality of skills

Seven trainees (25% of all trainees), in addition to two local stakeholders (involved in project coordination) and two outreach volunteers for Sudan filled out the survey in 2021, 3 years post the final training activities. The program was generally rated positively for its quality and its contributions to the skills & knowledge of participants and beyond. All trainees (7/7) who filled out the survey indicated they diagnose more cases that they would miss before and nearly all (6/7) report that the quality of their scans have improved and that they are able to share their gained knowledge with others. Other mentioned positive effects were on the communication with patients (4/7) and increasing the number of scans (2/7).

*'The Sudan program should be supported and extended. This program made a great change in practice and obviously decreasing maternal mortality & neonatal death. I suggest to contact with National Agencies to support this highly valuable work' – Sudan trainee.*

However, barriers in (mainly geographic) accessibility and ongoing health system challenges were also identified, primarily the lack of training, shortage of human resources, shortage of equipment, lack of monitoring & quality assurance and poor referral mechanisms.

## Additional income generation for practitioners

An outcome that was particularly identified through qualitative interviews for the case of Sudan was the increased income-generation from US services. Several practitioners in Sudan bought the machines brought by a sponsor of the training and use these, especially in private practices, feeling more confident about their ability to provide the services independently. This practice was felt to be empowering and income-generating and the case could be used to share with sponsors and funders of the program as a business case to market their machines to practitioners. However, these type of interventions and practices should be considered with caution, as it can be on expense of the quality of the service and the client's accessibility to the services. It emphasizes how training initiatives should be aligned with health system interventions, including governance systems that regulate services and assure quality. As many of the machines are used in the private sector, public-private partnerships may be a good opportunity to leverage access.

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<sup>14</sup> ISUOG (2018) Final program report Sudan.

<sup>15</sup> Program output: Training dedicated trainees in basic ultrasound in OB/GYN scanning and hone in on their skills by evaluating their progress and provide mentoring between programs

<sup>16</sup> Program outcome: Trainees competent OB/GN ultrasound scanning will increase level of anomaly identification and aid in preventing preventable causes of maternal mortality locally.

# Case study – Rwanda

## Training 27 trainees in Rwanda for phase 1

In October 2019 a first trip for the project in Rwanda phase 1 was conducted, in collaboration with the Rwandan Ministry of Health and the Rwandan Society of Obstetrics and Gynaecology. Twenty-seven trainees were trained in Masaka Hospital, Kigali.<sup>17</sup> Before trip 2 could take place, the Covid-19 pandemic emerged and the trip has been postponed since.

## Limited indicators and monitoring data available to assess results

No raw monitoring data were available for the research team to re-evaluate the programs output<sup>18</sup> or outcome<sup>19</sup>. Knowledge increase was measured through pre-post tests with a difference of 20% for the theoretical assessment and 16% for the practical assessment after the first training.<sup>4</sup>

## Positive perceptions of the program and its effects on quality of skills

Twelve trainees (44% of all trainees), in addition to two local stakeholders (involved in project coordination) and one outreach volunteer for Rwanda filled out the survey in 2021, over 1 year post the final training activities. Remarkably only one of them was female.

The program was generally rated positively for its quality and its contributions to the skills & knowledge of participants and beyond. Though only one training conducted, a large majority of the trainees who filled out the question on how the training affected their daily practice, indicated the quality of their scans has improved (9/9) and they have been able to share their gained knowledge with others (8/9). Other mentioned positive effects were on increase of case-identification (6/9), the communication with patients (4/9) and increasing the number of scans (2/9).

*'It has helped me gain confidence and tips to teaching of my junior and colleagues' – Rwandan trainee*

*'The courses are unique and the methodology used is excellent, even experts learn new things in a simple and systematic way' – Rwandan obstetrician gynaecologist, involved in local project coordination*

## Stakeholders identify areas for improvement that could still be addressed

However, barriers in accessibility and ongoing health system challenges were also identified, primarily the shortage of equipment, lack of training, shortage of human resources, and the lack of monitoring and quality assurance.

*'ISUOG could help to improve access of women to US by promoting collaboration with local partners and also with women who will benefit from such services. All the ISUOG outreach program activities are focused on healthcare providers. More strategies could be focused on understanding the enablers and barriers women face when they need an obstetric or gynaecological ultrasound.' – Rwanda outreach volunteer.*

*'ISUOG, among activities to implement, should also emphasize on community sensitization, on the availability of the service provision in Obstetrics and Gynecology scanning.' – Rwanda trainee*

As ISUOG is still early in the program (only 1 training conducted) there is large opportunity to address the additional identified needs.

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<sup>17</sup> Rwanda Phase 1 Trip 1 project review.

<sup>18</sup> Program output: Trainees competent and confident in OB/GN ultrasound scanning, and are able to provide training to midwives and nurses in Health Centres

<sup>19</sup> Program outcome: Increase level of anomaly identification and aid in preventing preventable causes of maternal mortality locally.

## Case study - Oman

### Training 27 trainees in Oman, resulting in five trainers of trainers for phase 2

Oman project phase 1 started in 2017, in collaboration with the Omani Ministry of Health and the Royal Hospital of Muscat. GE Healthcare provided US machines and simulators to the Ministry of Health throughout the program. Over the space of two years 27 trainees were trained in three training sessions for phase 1. Five trainees were selected to become trainers and further enrolled training throughout the country during phase 2.<sup>20</sup> The project ended in May 2021.

### Limited indicators and monitoring data available to assess results

Throughout phase 1 the retention of knowledge was monitored and reached 82% at the start of trip 3 (from 54% at the start of Trip 1), while for the practical skills retention reached 67% at the start of trip 3 (from 27% at the start of Trip 1)<sup>6,21</sup>. No monitoring data were available for the output<sup>22</sup> or outcome<sup>23</sup> of phase 2. The number of trainees from Oman who filled out the survey was too low to say something about quality of the training or spread of knowledge.

### Local ownership through the Omani Society of Ultrasound in Obs and Gyn

An additional development was the launch of the Omani Society of Ultrasound in Obstetrics and Gynecology (OSUOG) which is anticipated to be the main society in Oman to implement the Basic Training Curriculum of ISUOG as the national curriculum at both the National Training University (Sultan Qaboos) and via continuous US training throughout the country<sup>24</sup>. Even though a young organization, data from interviews indicated that OSUOG has been able to provide lectures and seminars both online and face to face. They are also helping in identifying new trainers and ensuring the capacity building of practitioners in the country.

### Well-established health system and national collaboration contributed to the success of the program in Oman

Interviewed stakeholders link the success of the program in Oman, especially compared to other implementation countries, to the health system that was already at a relative good shape when the program started. Oman has a good antenatal care and referral system, as well as an electronic database system. Also the fact that the program was initiated by a national team in collaboration with the local government was appointed as a factor that leveraged success. The local government continuously provided the support needed and committed to buy machines.

*'It has been a privilege that during the 3,5 years the program was run the majority of people in charge at the ministry of health remained involved. Also at the hospital where the program was executed we always dealt with the same head of department. The continuous commitment of these people was important for the success of the program.'*  
– Oman outreach volunteer

These findings in Oman confirm the conclusions in the main report that political will and strengthened health systems are needed to implement effective training and US services. The main

<sup>20</sup> ISUOG (2019) Oman outreach final project report.

<sup>21</sup> Vrachnis N, Cohen-Overbeek TE; collaborators. ISUOG ultrasound training in Oman: evaluating participant long-term retention and the effect of repetitive practical courses on ultrasound knowledge and skills [published online ahead of print, 2021 Mar 24]. *Ultrasound Obstet Gynecol.* 2021;10.1002/uog.23632. doi:10.1002/uog.23632

<sup>22</sup> Output phase 2: Empowering dedicated local trainers in training basic ultrasound in OB/GYN scanning and hone in on their skills by evaluating their progress and provide mentoring between programs.

<sup>23</sup> Outcome phase 2: Trainers will be competent in delivering OB/GN ultrasound training to help increase level of anomaly identification and aid in preventing preventable causes of maternal mortality locally.

<sup>24</sup> ISUOG CEO brief on outreach.

challenges in Oman, identified by respondent of the survey, were shortage of human resources, lack of training and lack of monitoring & quality assurance; challenges that are addressed by the outreach program. Problems in access were, besides geographic accessibility, appointed to barriers at the demand side, including that the need for services was not recognized or that women do not find the services of good quality. This is where US programs could still play a role in Oman.

*'ISUOG can partner with organisations that work with women in remote areas to enable them to access it's outreach activities. Continue training ultrasound providers in remote areas and provide them with support via virtual means (mentors) once they start working on ground.'* – Oman outreach volunteer

At the same time Oman, being a high income country, may as well have been in the position to pay for ISUOG's services, saving ISUOG's financial capacity for those health systems and women who are more in need. This is also a consideration ISUOG could exploit in its business case; income generation from services to those countries who can afford it.