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Perceptions of health workers on the referral of women with obstetric complications: a qualitative study in rural Sierra Leone

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3 1 **Perceptions of health workers on the referral of women with obstetric complications: a**
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5 2 **qualitative study in rural Sierra Leone**
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3 20 **ABSTRACT**
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6 21 **Objectives**
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9 22 Sierra Leone has one of the highest maternal mortality ratios in the world. Timely and well-
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11 23 coordinated referrals are necessary to reduce delays in providing adequate care for women
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14 24 with obstetric complications. This study describes the perspectives of health workers in rural
15
16 25 facilities in Sierra Leone concerning the referral of women with obstetric complications.
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20 26 **Design**
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23 27 A qualitative research with semi-structured interviews using open-ended questions. Data
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25 28 were analysed by systematic text condensation.
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29 29 **Setting**
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32 30 Interviews were held with health workers in nine peripheral health units in rural Sierra
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34 31 Leone.
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37 32 **Participants**
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40 33 19 health workers participated in nine interviews.
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42

43 34 **Results**
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46 35 From the interviews, four major themes emerged: 1) communication between health care
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48 36 workers; 2) underlying influences on decision-making; 3) women's compliance to referral; 4)
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50 37 logistic constraints.
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53
54 38 Several factors in rural Sierra Leone are perceived to complicate timely and adequate
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56 39 referral of women in need of emergency obstetric care. Notable among these factors are
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58 40 fear among women for being referred and fear among health care workers for having
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3 41 maternal deaths or severe obstetric complications occur at their own facilities. Furthermore,
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5 42 decision-making of health care workers concerning referral is negatively influenced by a
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8 43 hierarchical culture with high power distance between health care workers.
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11 44 **Conclusion**

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14 45 Factors identified that complicate timely and adequate referral of women in need of
15
16 46 emergency obstetric care must be considered in efforts to reduce maternal mortality.
17
18 47 Possible interventions that may reduce delay in referral include increased communication by
19
20 48 mobile phones between health workers for advice and feedback regarding referrals, and
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22 49 involvement of influential stakeholders to increase women's compliance to referral.
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30 51 **ARTICLE SUMMARY**

31 32 33 52 **Strengths and limitations of this study**

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36 53 • A strength of this study is the purposive and homogenous sampling used for the
37
38 54 selection of peripheral health units and health workers for the interviews, which is
39
40 55 representative of health facilities and health workers in rural Sierra Leone.
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43 56 • A strength of this study is the use of open-ended questions alongside an interview
44
45 57 guide, ensuring specific topics were discussed while allowing participants to
46
47 58 introduce and discuss additional topics.
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50 59 • A limitation of this study is that the data collected using semi-structured interviews
51
52 60 were not triangulated with quantitative data collected using other methods.
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55 61 • A limitation of this study is that a limited number of interviews were conducted with
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57 62 a limited number of participants.
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63 **KEYWORDS**

64 health worker; maternal health; obstetric complications; qualitative study; referral; Sierra

65 Leone

For peer review only

66 BACKGROUND

67 Sierra Leone has one of the highest maternal mortality ratios (MMR) in the world. According
68 to the Sierra Leone Demographic Health survey in 2013, the MMR was 1,165 per 100,000
69 live births [1]. The need to reduce this extremely high ratio is evident. In order to work
70 towards meeting the United Nations Sustainable Development Goal target of an MMR below
71 70 per 100 000 [2], the Ministry of Health and Sanitation of Sierra Leone launched the
72 Reproductive, Maternal, Newborn, Child and Adolescent Health Strategy in 2017, aiming to
73 reduce the MMR of 1,165 to 650 by 2021 [3].

74 An underlying factor of the high MMR in Sierra Leone is the persistent low rate of facility-
75 based births [1]. Country-wide in 2013, only slightly more than half of the women gave birth
76 in a health facility; 49.7% of women in rural areas versus 68.1% in urban areas [1]. The West-
77 African Ebola outbreak from 2013 to 2016 led to a further reduction in facility-based births
78 as a consequence of reduced possibilities and fear to access the health system during the
79 crisis [4, 5].

80 Pregnant women in Sierra Leone face many barriers to facility-based birth, including long
81 distances, inability to afford costs of transport and healthcare and lack of trust in health
82 facilities [6]. These factors contribute to a phase-1 delay in deciding to seek healthcare in
83 case of an emergency obstetric complication, as described in the three-phase delay model
84 by Thaddeus and Maine [7]. Even after having decided to seek health care, women are often
85 confronted with delays in phase 2 (transport delay), and phase 3 (delay in diagnosis and
86 treatment at the facility) [8]. Timely and well-coordinated referrals are necessary to reduce
87 delay in receiving adequate obstetric care for women with obstetric complications.

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3 88 Currently, there is no literature available analysing aspects of reasons for delay of care
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5 89 within the obstetric referral system in rural Sierra Leone.
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9 90 This study describes the perspectives of health workers in rural facilities concerning the
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11 91 referral system for women with obstetric complications. This data will provide better
12
13 92 understanding of challenges within the health system faced by women who are referred
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15 93 with emergency obstetric complications in rural Sierra Leone.
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18 19 94 **METHODS**

20 21 22 95 **Study design and setting**

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25 96 This qualitative study following the COREQ checklist of reporting [9] (Supplementary File 1)
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27 97 was conducted between the 1st of September 2018 and the 15th of March 2019 in Tonkolili
28
29 98 District. This district is located in the Northern Province of Sierra Leone and sub-divided into
30
31 99 eleven chiefdoms. Three hospitals with Comprehensive Emergency Obstetric and Neonatal
32
33 100 Care are located in Tonkolili District. Basic and Comprehensive Emergency Obstetric and
34
35 101 Neonatal Care (BEmONC and CEmONC) are services fundamental to provide adequate health
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37 102 care during pregnancy and childbirth. The signal functions of BEmONC and CEmONC centres
38
39 103 are summarised in Supplementary File 2. Three chiefdoms in the north of Tonkolili District,
40
41 104 Kafe Simiria, Kalansogoia and Sambaya Bendugu, with a combined population of 113,521
42
43 105 (2018), are served by two CEmONC centres, Magburaka Government Hospital and Masanga
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45 106 Hospital, an NGO-supported government hospital. Besides the two CEmONC centres, these
46
47 107 chiefdoms are served by fifteen peripheral health units (PHUs), including four BEmONC
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49 108 centres. The maternity services provided at each facility level in these chiefdoms, according
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51 109 to the Ministry of Health and Sanitation, are summarised in Table 1.
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Table 1: Maternity services purportedly provided at each level of health facility

Maternal and Child Health Post (MCHP)	<ul style="list-style-type: none"> • Antenatal care <ul style="list-style-type: none"> ○ Nutritional supplementation in pregnancy (e.g. iron, folic acid and multivitamins) ○ Risk selection and ensuing referral ○ Malaria intermittent preventive treatment • Intra- and postpartum care <ul style="list-style-type: none"> ○ Monitoring of labour by using the partograph ○ Cord clamping ○ Active management of the third stage of labour • Postnatal care <ul style="list-style-type: none"> ○ Clinical assessment of the neonate (e.g. fever, convulsions, feeding) ○ Exclusive breastfeeding recommendation ○ Cord care ○ Clinical assessment of mother (e.g. temperature, blood pressure, bleeding) ○ Family planning counselling
Community Health Post (CHP)	<ul style="list-style-type: none"> • MCHP services (see above)
Community Health Centre (CHC)	<ul style="list-style-type: none"> • MCHP services (see above) <i>plus</i> • Maternal anaemia and urine sediment assessment

	<ul style="list-style-type: none"> • BEmONC services (see supplementary file 2)
District Hospital	<ul style="list-style-type: none"> • MCHP services (see above) <p><i>plus</i></p> <ul style="list-style-type: none"> • Maternal anaemia, urine, HIV, malaria and tuberculosis assessment • Ultrasound scan • CEmONC services (see supplementary file 2)

110 However, not all facilities designated to provide BEmONC and CEmONC in rural Sierra Leone
 111 are able to provide the full range of signal functions [10, 11]. Therefore, several BEmONC
 112 and CEmONC signal functions might not actually be provided in practice. Referral occurs
 113 both in consecutive order starting from Maternal and Child Health Posts (MCHPs) as well as
 114 between lower level health facilities and district hospitals. Sierra Leone has national
 115 protocols for emergency obstetric care, including referral indications [12].

116 The chiefdoms in northern Tonkolili District were selected, since these three combined
 117 comprise the catchment area for emergency obstetric complications belonging to Masanga
 118 Hospital, for reasons of geography such as impassable rivers and mountains and accessibility
 119 by road.

120 **Study Subject and Public involvement**

121 The District Health Management Team was involved in the design, conduct, reporting and
 122 dissemination planning of our research.

123 **Data collection**

1
2
3 124 The qualitative data used in this study was collected using nine semi-structured interviews
4
5 125 conducted by RP (Master of Medicine student, male) between November 2018 and January
6
7
8 126 2019. Purposive sampling was used to ensure variation between selected facilities where
9
10 127 interviews were conducted. Selected facilities were thus located in different chiefdoms,
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12
13 128 provided different levels of care, and had varying accessibilities of the nearest district
14
15 129 hospital (Table 2).
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18
19 Table 2: Facilities where interviews were conducted
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Town	Level	Distance to district hospital (km)	Travel time to district hospital* (min)
Chiefdom Kafe Simiria			
Mabontor	CHC	18.9	40
Masumbrie	CHC	21.5	40
Makontande	MCHP	28.9	50
Chiefdom Kalansogoia			
Bumbuna	CHC	42.6	70
Kamasaypana	MCHP	50.0	100
Kemedugu	MCHP	58.5	110
Chiefdom Sambaya Bendugu			
Bendugu	CHC	81.4	150
Kunya	CHP	92.3	180
Dankawalia	MCHP	71.9	135

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* Travel time by motorbike during dry season (November – May). Travel time during rainy season (June – October) will be substantially longer. Travel time by ambulance will be shorter. Roads were unpaved.

130 Selected facilities were approached either by telephone calls to the in-charge health worker
 131 or by face-to-face visits to that health facility. Homogenous sampling was used as each
 132 interview was conducted with health workers of different cadres currently working in the
 133 same health centre. In total, nineteen health workers participated in the nine interviews. All
 134 participants were explained the relevance and goals of the research. No facility or individual
 135 health worker refused participation. Respective health worker cadres and competencies of
 136 the participants are summarised in Table 3.

Table 3: Cadres and competencies of respondents

Health worker (number interviewed)	Competencies
Maternal and Child Health aid (MCH aid) (10)	2 years training. Competent in basic obstetric care.
State Enrolled Clinical Health Nurse (SECHN) (2)	2,5 years training. Competent in basic obstetric care.
Community Health Assistant (CHA) (3)	2 years theoretical + 1-year practical training. Competent in basic obstetric care.
Community Health Officer (CHO) (2)	3 years theoretical + 1-year practical training. Competent in basic obstetric care. No training in emergency obstetric care.

Midwife (2)	SECHN training + 1,5 year-midwifery training. Competent in emergency obstetric care including oxytocin administration, manual placenta removal, first treatment for (pre)eclampsia. No training in vacuum extraction.
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137 The interview guide (Supplementary File 3) was used as a framework of themes to be
 138 discussed during the interviews. The guide was initially developed using themes described by
 139 Thaddeus and Maine [7], previous literature concerning pregnancy and childbirth in Sierra
 140 Leone [6, 13], and preliminary discussions with stakeholders such as medical officers,
 141 community health officers (CHO), midwives and logistical officers employed at district
 142 referral hospitals. The guide was piloted in one PHU with two health workers. The interviews
 143 were held inside the respective health facilities where only participants and interviewer
 144 were present. The interviews were conducted in English, using open-ended questions, and
 145 lasted between 30 and 60 minutes each. Data was collected using audio recording. Repeat
 146 interviews were not carried out and transcripts were not returned to participants for
 147 comments and correction for logistical reasons: there was no funding or practical possibility
 148 to re-visit these widely spread-out facilities.

149 **Analysis**

150 All audio recordings of interviews were transcribed verbatim by RP using Express Scribe
 151 Transcription Software (NCH Software, Greenwood Village, Colorado, USA). Content analysis
 152 was performed by RP through systematic text condensation as described by Malterud [14].
 153 Preliminary themes were identified after transcription of the interviews, and were further
 154 specified by systematic coding and categorisation of quotes, whereupon a condensate of
 155 every theme was written based on the quotes. Data analysis was performed manually.

156 **Ethical Considerations**

157 The study proposal was endorsed by the Masanga Medical Research Unit Scientific Review
158 Committee. Ethical approval was obtained from the Sierra Leone National Ethics and
159 Scientific Review Committee on 29 January 2019. Permission to conduct the study in
160 Tonkolili District was obtained from the District Health Management Team. Written
161 informed consent was obtained from interview participants.

162 **RESULTS**

163 From these interviews, four major themes emerged: 1) communication between health care
164 workers, 2) underlying influences on decision making, 3) women's compliance to referral, 4)
165 logistic constraints.

166 **1) Importance of communication between staff of different health centres**

167 **Giving and receiving advice surrounding referrals.** Most health workers mentioned the
168 necessity of asking for advice when having to decide whether to continue management or
169 refer the woman to a higher-level health centre. One community health assistant (CHA)
170 explains:

171 *"I am not saying 100% I know what I am doing. I know myself. I learn, I can just know*
172 *my own area and then there are people who know better. I am just a community*
173 *health officer, assistant in fact."* (male CHA, MCHP)

174 Advice was often asked for and given in mobile phone conversations. However, sometimes
175 higher cadre health workers travelled to health facilities to review women themselves
176 before advice was given. Those asked for advice include CHOs, midwives, the District Health
177 Sisters (supervising midwives, members of the Tonkolili District Health Management Team),

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3 178 the head of a maternity ward or a medical officer at a district hospital. However, one
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5 179 maternal and child health aid (MCH aid) mentioned that if she recognized a woman requiring
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8 180 urgent referral to a higher-level facility, she would not delay by first calling for advice but
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10 181 rather directly refer the woman to the community health centre (CHC). She would not,
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12 182 however, directly refer the woman to a district hospital or inform the CHC that this woman
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14 183 likely needed onward referral, since she believed that this decision had to be made by CHC
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16 184 staff.

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20 185 Besides needing advice on whether or not to refer the woman to a higher-level facility,
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22 186 participants also mentioned a need for advice over the phone regarding clinical
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24 187 management while waiting for the ambulance to arrive, since this could take up to several
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26 188 hours.

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31 189 **Feedback after referral.** Many health workers indicated that they were interested in the
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33 190 clinical course after a woman had been referred to the district hospital, as illustrated by one
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35 191 CHO:

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39 192 *"We are highly interested in feedback, because they are lives and when we call on you*
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41 193 *people to rescue, then we have interest over them."* (male CHA, CHC)

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43
44 194 Health workers in lower level facilities expressed a specific interest in knowing the clinical
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46 195 management including decisions on mode of birth at the district hospital. These health
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48 196 workers were often approached by relatives of the referred woman requesting updates on
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50 197 her clinical condition and outcome. Health workers regularly marked their phone numbers
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52 198 on the referral notes in order to receive feedback. However, many respondents complained
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54 199 never receiving a response from district hospital staff. Instead, they felt forced to call the
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3 200 district hospital themselves, and indicated this comprised a communication barrier, since it
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5 201 required them to spend their own mobile phone credits.
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9 202 Similarly, health workers complained of never receiving discharge notes with follow-up
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11 203 information after the woman had been discharged from the district hospital. They generally
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13 204 relied on the information the woman could give them verbally.
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16 205 **2) Underlying influences on decision-making**

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20 206 **Referral, perceived as the safest option for health workers.** The necessity of referral, as
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22 207 expressed by one health worker, was often to avoid complications and maternal death
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24 208 occurring at their own facility.
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28 209 *"If a maternal death is here, we are going to suffer."* (female SECHN, MCHP)
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31 210 Often, a referred woman was described as 'not my case'. Another health worker mentioned
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33 211 that when a woman was referred to a CHC, it was up to that facility to manage the woman
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35 212 with the complication and decide what to do. Such transfer of responsibility after referral
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37 213 was further illustrated by a story recounted by an MCH aid about a woman she had recently
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39 214 referred:
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43 215 *"Yes, I delivered her. Male baby. Fresh still birth. So it is not my problem, because I*
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45 216 *have already referred her."* (female MCH aid, MCHP)
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49 217 **Endangering behaviour by women requiring referral.** Some women did not want to be
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51 218 referred and health workers were under a lot of pressure from women and relatives while
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53 219 making a referral decision. Women and relatives were at times perceived not to tell the
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55 220 truth when questioned about history, since they wanted to prevent referral. One health
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57 221 worker mentioned that he sometimes heard rumours in the community that the point in
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3 222 time a woman and her relatives indicated as when onset of symptoms occurred was not
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5 223 always correct. Most respondents described that when a woman and her relatives were told
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8 224 that she needed to be referred, they started begging health workers not to refer her but to
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10 225 continue clinical management at the same facility. Women and relatives would try to
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13 226 convince them that they, as health workers, would be able to manage the woman with the
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15 227 complication without referral. One MCH aid stated:

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18 228 *"They will want us to do everything while we don't have that ability."* (female SECHN,
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21 229 CHC)

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24 230 A CHA voiced his frustration at the women's and relatives' behaviour and stated that it
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26 231 endangered his own work.

29 232 **3) Women's compliance with referral**

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32 233 **Influential stakeholders involved to improve compliance.** Referral to a district hospital was
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34 234 perceived to come with many fears and worries for a pregnant woman. Examples mentioned
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36 235 by health workers included fear of undergoing surgery, viral haemorrhagic fever (Ebola or
37
38 236 Lassa virus) infection, blood donation, male health workers and an unfamiliar environment
39
40 237 in terms of language and people. Such fears contributed to women returning home instead
41
42 238 of travelling to the health centre they were referred to. Respondents identified three
43
44 239 influential stakeholders who may potentially reduce fears around referral. The first
45
46 240 stakeholder was the chief of the village or town, whose advice and instruction were of
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48 241 substantial influence on the women's and relatives' referral compliance. The second group
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50 242 of stakeholders, recognised by health workers as similarly influential, consisted of relatives
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52 243 in Freetown, the capital of Sierra Leone. One state-enrolled community health nurse
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54 244 (SECHN) stated:

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2
3 245 *"They will always listen to their relatives out there."* (female SECHN, MCHP)
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5

6 246 These relatives in Freetown were contacted and requested to attempt to convince the
7
8 247 woman of the necessity of the referral and to adhere to the referral instructions. Finally,
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10 248 according to the health workers, women who had previously been referred to a district
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12 249 hospital and returned safely had a positive influence on a woman's perceptions regarding
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14 250 referrals to district hospitals.
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19 251 **4) Logistical constraints**
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22 252 **Medicine shortage as a burden on the referral system.** The logistical constraints of dealing
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24 253 with stockouts of medication in PHUs comprised an additional burden on the referral
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26 254 system. Many health workers, especially those working in CHCs, complained of struggling
27
28 255 with medication shortages. Injectable antibiotics were often mentioned as insufficient for
29
30 256 the purposed term. When medication stocks had been exhausted, the health worker was
31
32 257 faced with two options. The first option was to request money from the woman to purchase
33
34 258 medication at a local pharmacy. One health worker described the friction this created with
35
36 259 the Free Health Care Scheme for pregnant and lactating women, since it was by law illegal to
37
38 260 request money from these women.
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45 261 *"I am not going to ask her to pay for the service I am rendering but just to provide the*
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47 262 *drug. But me that is punishable crime, I cannot... Then I be in fault."* (male CHA, CHC)
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49

50 263 However, sending a woman directly to the pharmacy to buy medication themselves was not
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52 264 safe according to several health workers. They expressed their distrust in local pharmacists
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54 265 as they suspected them of not being properly trained and sometimes giving the wrong
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56 266 medication as well as administering injectable drugs themselves against regulations.
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3 267 Health workers were therefore often forced to resort to referral to a district hospital in order
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6 268 for a woman to access the correct medication. The CHA voiced his desperation:

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9 269 *“So what would you do? You just have to refer.”* (male CHA, CHC)

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11
12 270 He also expressed his worry about the reaction from the district hospital after receiving such
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14 271 referrals. He feared that the district hospital would doubt the competency of the health
15
16 272 workers at the PHU referring a woman who could potentially be managed at their own
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19 273 facility. Finally, some respondents pointed out that referring such a woman exposed them to
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21 274 additional adverse outcomes such as the relatives falling back on traditional medicine or
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24 275 going to a local pharmacy, since this was cheaper than paying for referral transportation.

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27 276 **Inadequate ambulance availability.** Tonkolili District has a limited number of ambulances
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29 277 available for the transport of women with emergency obstetric complications. Many health
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32 278 workers complained about the fact that when they call for an ambulance, they are told that
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34 279 the ambulance has broken down or to wait since the ambulance is on its way to a different,
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37 280 sometimes very distant PHU. It was also noted that it sometimes takes a long time before
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39 281 the ambulance team, comprised of a driver and a nurse, is mobilised at the district hospital
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41
42 282 and the ambulance is finally under way. One CHA summarised the problem as:

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45 283 *“So sometimes it’s very difficult; the time the ambulance is here, the patient is*
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47 284 *seriously in a critical condition.”* (male CHA, CHC)

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50 285 Another problem reported was the road accessibility of certain PHUs. Some of these PHUs
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53 286 can only be reached by motorbike and on foot. Accessibility is worse during rainy season.
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55 287 Ambulance transport during the rainy season was even stated to be not possible at all for
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57
58 288 several PHUs.
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3 289 **DISCUSSION**
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6 290 This study highlights several aspects of the obstetric referral system in rural Sierra Leone,
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8 291 which require attention in order to provide timely and adequate management of women
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11 292 with emergency obstetric complications.
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14 293 **Importance of communication between staff of different health centres**
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17 294 The importance of communication between health centres to achieve an effective referral
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20 295 system was widely acknowledged by participating providers. Health care workers generally
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22 296 concurred with each other on the advantages of receiving advice on whether to continue
23
24 297 management, or to refer a woman instead. However, our findings concerning the practice of
25
26 298 waiting for a higher-cadre health worker from a different health facility to arrive and
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28 299 personally examine the woman before advising on a referral decision, are in disagreement
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32 300 with protocol and would increase type 2 delay. This delay can be largely abated by adequate
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34 301 use of mobile phones to communicate with higher-cadre health workers for advice regarding
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37 302 referral decisions [15], as well as further education for MCH aids who will not need a second
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39 303 opinion anymore. Furthermore, the reluctance of lower-cadre health workers in referring
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42 304 women directly to a district hospital and thereby bypassing the higher-cadre health worker's
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44 305 judgment as well as the reluctance of referring women to a CHC with the advice to further
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46 306 refer to a district hospital reveal potentially harmful hierarchy between health workers.
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48
49 307 From Tanzania, Ueno et al. reported a similar atmosphere of hierarchy and lack of
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52 308 cooperation between different cadres of health workers and levels of health facilities as a
53
54 309 challenge to EmOC service delivery [16].
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57 310 Our findings also imply that following referral, district hospitals need to take initiative in
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59 311 providing health workers in PHUs with feedback in order to improve and encourage future
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3 312 referrals and follow-up management of the woman after discharge from the district hospital.
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5 313 Studies in Ghana, Burundi and Northern Uganda reported similar demands for feedback
6
7 314 after referral [17-19]. Multiple other studies have described related gaps in communication
8
9 315 surrounding obstetric referrals [20, 21] and have specified the critical role of communication
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11 316 in an effective referral system [21-24]. Improvement in communication between health
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13 317 facilities and health workers is a necessary first step towards improving the referral system
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15 318 in northern Tonkolili District.

21 319 **Underlying influences on decision-making**

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23
24 320 Our findings point at a mindset of some health workers regarding obstetric referrals that has
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26 321 potential adverse effects on timely management of women with emergency obstetric
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28 322 complications. Maternal mortality and morbidity were seen as tragic events for women and
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30 323 relatives, but also alarming for themselves as health workers. Referral and the ensuing
31
32 324 transfer of responsibility was regarded as an option to prevent themselves from being
33
34 325 blamed in case of a complication. It is hypothesised that this mind-set is an adverse result of
35
36 326 the increased awareness of, and attention to, the high maternal mortality and morbidity
37
38 327 rates in Sierra Leone. Obstetric audits have been proven to be an effective method of
39
40 328 reducing maternal mortality and morbidity [25-27], but a negative impact on work
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42 329 satisfaction and motivation have also been reported [27, 28]. However, our findings provide
43
44 330 limited evidence and further research in rural Sierra Leone is essential to accurately analyse
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46 331 this information.

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48 332 Another underlying influence which became apparent throughout the interviews was the
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50 333 persuasiveness of women and relatives who did not want to be referred to a different health
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52 334 facility. Such persuasiveness has potential to delay the referral decision made by a health
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3 335 worker and thus results in phase 1 and phase 2 delays. Also, it may lead to over-confidence
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5 336 of lower-cadre health workers respecting their ability in managing women with obstetric
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8 337 complications, as has been previously reported in Sierra Leone by Theuring et al. [13].
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10 11 338 **Improving women's compliance with referral**

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14 339 Fears experienced by women, as reported by health workers, to accept referral to a district
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16 340 hospital such as fear of operations, blood donation, male health workers conducting births,
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18 341 and a new environment were largely similar to those previously reported by multiple studies
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20 342 in similar settings [17, 19, 29, 30]. A lingering fear of Ebola in district hospitals in post-Ebola
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22 343 regions including Sierra Leone has been described by several other studies [13, 31, 32].
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24 344 Three groups of influential stakeholders were identified: local village chiefs, relatives in the
25
26 345 capital, Freetown; and women who have previously been referred to a district hospital and
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28 346 have returned safely. Consulting these stakeholders in case of referral refusal will potentially
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30 347 increase women's compliance. These stakeholders are understood to be similarly influential
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32 348 in all rural areas of Sierra Leone.
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39 349 **Logistical constraints**

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42 350 The influence of medication shortage in PHUs on the effectiveness of the referral system
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44 351 becomes apparent through our findings. The combined effect of the Free Health Care
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46 352 Scheme [33] and the distrust in local pharmacies forces health workers into avoidable
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48 353 referrals to district hospitals. In turn, these referrals lead women to a choice of options from
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50 354 traditional medication or buying medication from a local pharmacy. The shortage of
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52 355 medication in PHUs is a burden on and complicating factor of the referral system in northern
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56 356 Tonkolili District; however, adequate availability of medication should not avert mandatory
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3 357 referrals of women with obstetric complications, which require management in district
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6 358 hospitals.

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9 359 The shortage of ambulances for transport of women from lower-level health facilities to
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11 360 district hospitals is a commonly reported contributor to phase 2 delay in sub-Saharan Africa
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13 361 [17-19, 34, 35]. Our findings show that this barrier to access to adequate emergency
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16 362 obstetric care is also present in rural Sierra Leone. The inability of ambulances to reach
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18 363 certain PHUs, due to arduous terrain such as steep hills and river crossings and poor road
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21 364 conditions, worsened by seasonal rains, displays the poor infrastructure of rural Sierra
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23 365 Leone.

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26 366 In February 2019, after our data collection was completed, the Ministry of Health and
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29 367 Sanitation of Sierra Leone and the non-governmental organisation Doctors with Africa
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31 368 CUAMM launched the National Emergency Medical Service (NEMS), which provides free-of-
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33 369 charge ambulance service in all of Sierra Leone. The implementation of the NEMS allows for
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36 370 imperative reduction in delay in access to adequate emergency obstetric care in district
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38 371 hospitals. This reduction in delay is possible as the number of functioning ambulances is
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41 372 increased, and as the travel time is decreased as soon as the ambulances are not only
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43 373 stationed in district hospitals any longer, but also in PHUs.

44 45 46 374 **Strengths and Limitations**

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49 375 A strength of this study is the selection of PHUs and health workers for the interviews, which
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51 376 is representative of health facilities and health workers in rural Sierra Leone. Therefore,
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53 377 interventions targeting the obstetric referral system in other areas of rural Sierra Leone can
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55 378 be supported by our findings. Another strength is the use of open-ended questions during
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58 379 the interviews, which allowed the participants to express their own experiences and feelings.
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3 380 Additionally, as this study was conducted before the implementation of the NEMS, this study
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5 381 allows for a follow-up study analysing the effect of the NEMS. The authors hypothesise that
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8 382 only the themes 'communication' and 'logistical constraints' have been affected by the
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10 383 NEMS.

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12
13 384 A limitation of this study was that the data collected using semi-structured interviews was
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16 385 not triangulated with quantitative data collected with other methods. Additionally, a limited
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18 386 number of interviews were conducted which lowers the quality of evidence. Lastly, the
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20 387 interviews were conducted in English while the participants were more familiar with Krio.

21 388 **CONCLUSION**

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24 389 In the perspectives of health care workers, delay in access to adequate emergency obstetric
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27 390 care is caused by lack of communication between health workers at different facilities, lack
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29 391 of involvement of influential stakeholders, medication shortage and lack of ambulance
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31 392 services. Of note, fear among women and their relatives for them to be referred is another
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33 393 cause of delay. Furthermore, the decision-making of health care workers concerning referral
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35 394 is negatively influenced by an atmosphere of hierarchy and fear of having maternal deaths
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37 395 and other severe complications at their facility.

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40 396 Interventions that may reduce delay in access to adequate emergency obstetric care include
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42 397 communication by mobile phones for advice regarding referral decisions and for feedback
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44 398 after a referral decision has been made. Involvement of influential stakeholders to increase
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46 399 women's compliance to referral is an additional intervention that may be considered.

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49 400 This study highlights factors that may complicate timely and adequate referral of women in
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52 401 need of emergency obstetric care. As this delay is an underlying cause of the high MMR in
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3 402 rural Sierra Leone, these potential sources and causes of delay must be considered in efforts
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6 403 to reduce maternal mortality.
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8 9 404 **LIST OF ABBREVIATIONS**

10
11 405 MMR: Maternal Mortality Ratio;

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14 406 BEmONC: Basic Emergency Obstetric and Neonatal Care;

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17 407 CEmONC: Comprehensive Emergency Obstetric and Neonatal Care;

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20 408 MCHP: Maternal and Child Health Post;

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23 409 CHP: Community Health Post;

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26 410 CHC: Community Health Centre;

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29 411 PHU: Peripheral Health Unit;

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32 412 CHO: Community Health Officer;

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35 413 CHA: Community Health Assistant;

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38 414 SECHN: State-Enrolled Community Health Nurse;

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41 415 MCH-aid: Maternal and Child Health Aid;

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44 416 NEMS: National Emergency Medical Service
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46 47 48 417 **DECLARATIONS**

49 50 51 418 **Ethics approval and consent to participate**

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53
54 419 The study proposal was endorsed by the Masanga Medical Research Unit Scientific Review

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56
57 420 Committee. Ethical approval was obtained from the Sierra Leone Ethics and Scientific Review

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60 421 Committee. Permission to conduct the study in Tonkolili District was obtained from the

1
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3 422 District Health Management Team. Written informed consent was obtained from interview
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6 423 participants.

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9 424 **Data availability**

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12 425 The datasets used and/or analysed during the current study are available from the
13
14 426 corresponding author on reasonable request.

15
16
17 427 **Competing Interests**

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20 428 All authors declare that they have no competing interests.

21
22
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27
28 431 or not-for-profit sectors.

29
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31 432 **Author Contributions**

32
33
34 433 RP carried out the field work, analysed the data and wrote the first draft of the paper. HM
35
36 434 and JvN conceived the study and contributed to phrasing the study question, data
37
38 435 interpretation and writing of the paper. AF, PSK and MPG contributed to data interpretation
39
40 436 and writing of the paper. TvdA oversaw the conduct of the study and contributed to data
41
42 437 interpretation and writing of the paper. All authors have contributed to the writing of, and
43
44 438 approved the final version of the paper.

45
46
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51
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SUPPLEMENTARY FILE 1

COREQ checklist of reporting

Topic	Item No.	Guide Questions/Description	Reported on Page No.
Domain 1: Research team and reflexivity			
<i>Personal characteristics</i>			
Interviewer/facilitator	1	Which author/s conducted the interview or focus group?	8
Credentials	2	What were the researcher's credentials? E.g. PhD, MD	8
Occupation	3	What was their occupation at the time of the study?	8
Gender	4	Was the researcher male or female?	8
Experience and training	5	What experience or training did the researcher have?	8
<i>Relationship with participants</i>			
Relationship established	6	Was a relationship established prior to study commencement?	10
Participant knowledge of the interviewer	7	What did the participants know about the researcher? e.g. personal goals, reasons for doing the research	10
Interviewer characteristics	8	What characteristics were reported about the interviewer/facilitator? e.g. Bias, assumptions, reasons and interests in the research topic	10
Domain 2: Study design			
<i>Theoretical framework</i>			
Methodological orientation and Theory	9	What methodological orientation was stated to underpin the study? e.g. grounded theory, discourse analysis, ethnography, phenomenology, content analysis	11
<i>Participant selection</i>			
Sampling	10	How were participants selected? e.g. purposive, convenience, consecutive, snowball	8, 10
Method of approach	11	How were participants approached? e.g. face-to-face, telephone, mail, email	10
Sample size	12	How many participants were in the study?	10
Non-participation	13	How many people refused to participate or dropped out? Reasons?	10
<i>Setting</i>			
Setting of data collection	14	Where was the data collected? e.g. home, clinic, workplace	6, 9, 11
Presence of non-participants	15	Was anyone else present besides the participants and researchers?	11
Description of sample	16	What are the important characteristics of the sample? e.g. demographic data, date	6, 10
<i>Data collection</i>			
Interview guide	17	Were questions, prompts, guides provided by the authors? Was it pilot tested?	11
Repeat interviews	18	Were repeat interviews carried out? If yes, how many?	11
Audio/visual recording	19	Did the research use audio or visual recording to collect the data?	11
Field notes	20	Were field notes made during and/or after the interview or focus group?	N/A
Duration	21	What was the duration of the interviews or focus group?	11
Data saturation	22	Was data saturation discussed?	N/A
Transcripts returned	23	Were transcripts returned to participants for comment and/or correction?	11

Topic	Item No.	Guide Questions/Description	Reported on Page No.
Domain 3: analysis and findings			
<i>Data analysis</i>			
Number of data coders	24	How many data coders coded the data?	11
Description of the coding tree	25	Did authors provide a description of the coding tree?	11
Derivation of themes	26	Were themes identified in advance or derived from the data?	11
Software	27	What software, if applicable, was used to manage the data?	11
Participant checking	28	Did participants provide feedback on the findings?	11
<i>Reporting</i>			
Quotations presented	29	Were participant quotations presented to illustrate the themes/findings? Was each quotation identified? e.g. participant number	12-17
Data and findings consistent	30	Was there consistency between the data presented and the findings?	22
Clarity of major themes	31	Were major themes clearly presented in the findings?	12
Clarity of minor themes	32	Is there a description of diverse cases or discussion of minor themes?	N/A

Developed from: Tong A, Sainsbury P, Craig J. Consolidated criteria for reporting qualitative research (COREQ): a 32-item checklist for interviews and focus groups. *International Journal for Quality in Health Care*. 2007. Volume 19, Number 6: pp. 349 – 357

SUPPLEMENTARY FILE 2**Signal functions of BEmONC and CEmONC**

Basic Emergency Obstetric and Neonatal Care (BEmONC)

1. Parenteral treatment of infections (antibiotics)
2. Parenteral treatment of severe pre-eclampsia/eclampsia (e.g., MgSO₄)
3. Treatment of PPH (e.g., uterotonics)
4. Manual vacuum aspiration of retained products of conception
5. Assisted vaginal delivery (e.g., vacuum-assisted delivery)
6. Manual removal of placenta
7. New-born resuscitation

Comprehensive Emergency Obstetric and Neonatal Care (CEmONC)

All components of BEmONC, plus

1. Surgical capability, including anaesthesia (e.g., Caesarean Section)
2. Blood transfusion

SUPPLEMENTARY FILE 3**Interview Guide Obstetric Referral System Northern Tonkolili District**

General

1. Describe the catchment area of this health facility (number of villages, terrain).
2. Describe this health facility (number and competency of staff, average number of births and referrals).
3. Describe the referral options of this health facility (nearest health facility, nearest CHC, nearest district hospital).

Authorisation

4. Which of the staff is allowed to decide to refer women to another facility?
5. Is there always staff present that is allowed to independently refer women?
6. Does the CHO or midwife in the CHC have to be contacted before referring a woman to another facility?

Referral Process

7. Describe the steps taken when referring a pregnant or post-partum women.
8. Describe how/if referral notes are used in this health facility.
9. Describe the benefit of referral notes.
10. Describe how/if feedback is received from the referral facility.
11. Describe how/if advice is obtained from other health workers before referral.
12. Describe how/if national guidelines are used for referring a woman.
13. Describe how/if maternity patients without an emergency indication are referred to a different health facility.

Accessibility

14. Describe the accessibility of Magburaka Government Hospital from here.
15. Describe the accessibility of Masanga Hospital from here.
16. If you were to refer 10 women to a hospital, how many of them do you think will actually arrive at the hospital?
17. Describe some reasons why referred women sometimes refuse referral.
18. Describe transportation options available for referral.

Ambulance Referrals

19. Describe the process of ordering an ambulance from Magburaka Government Hospital.
20. Describe the process of ordering an ambulance from Masanga Hospital.
21. How many times have you ordered an ambulance in the past month?
22. How long does it take for the ambulance to arrive at your health facility after you have ordered the ambulance? (from Magburaka/Masanga)
23. Which of the staff is allowed to order an ambulance?
24. Is there always staff present that is allowed to order an ambulance?

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2
3 25. Does the CHO or midwife in the CHC have to be contacted before ordering an
4 ambulance?
5
6 26. Is transferral by ambulance free for the woman?
7
8 27. Describe problems with the current ambulance referral system.
9
10 28. Describe recommendations for improving the ambulance referral system.

11 ANC/under 5

- 12 29. Describe the antenatal care in this health facility (frequency of ANC-days, number of
13 women)
14
15 30. Describe how/if governmental Maternity Record Cards are used during ANC visits,
16 delivery and postnatal checks.
17

18 Masanga Hospital

- 19
20 31. Describe recommendations for improving the health care at Masanga Hospital.
21
22 32. Is Masanga Hospital an official referral hospital in Tonkolili District?
23
24 33. Is healthcare free for pregnant and lactating women and children under 5 at
25 Masanga Hospital?
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SUPPLEMENTARY FILE 4

Original study protocol

Includes protocol regarding quantitative research which is not included in submitted article

For peer review only

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3 **The current situation of maternal health in Tonkolili District and the**
4 **perceptions of health workers at peripheral health units in the catchment**
5 **area of Masanga Hospital concerning the current referral system of obstetric**
6 **patients**
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38 **Lead applicant**
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40 Ryan Proos, medical student Leiden University Medical Center, Masanga Hospital Sierra Leone

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42 Correspondence address: e-mail: ryanproos9@gmail.com Tel: +232 76557283
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44

45 **Supervisor**
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47 Dr. T. van den Akker, Leiden University Medical Center, Netherlands (Gynaecology and Obstetrics)
48
49

50 **Research team**
51

52 Hanna Mathéron, MD Global Health and Tropical Medicine, Medical Officer Masanga Hospital
53

54 Teneh Kamara, midwife at Masanga Hospital Sierra Leone
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Background

Sierra Leone is one of the most dangerous countries for women to be pregnant and to give birth. According to the Sierra Leone Demographic Health Survey (2013)¹, Sierra Leone has a maternal mortality ratio (MMR) of 1,165 per 100,000 live births, the highest in the world and more than six times the global average. The UN Sustainable Development Goals (SDGs), adopted in 2015, aim for a reduction of the global maternal mortality ratio to less than 70 per 100,000 live births in 2030. In line with these SDGs, the Ministry of Health and Sanitation of Sierra Leone launched the Reproductive, Maternal, Newborn, Child and Adolescent Health (RMNCAH) Strategy in 2017, which aims for a reduction of preventable deaths of women, children and adolescents and ensuring their well-being². The target is to reduce the MMR of 1,165 per 100,000 live births to 650 per 100,000 live births by 2021. With launching this strategy, the government acknowledges the need for change, but there is still a long way to go to achieve this goal.

Masanga Hospital is situated in Tonkolili district, centrally located in the Northern Province of Sierra Leone. The catchment area of Masanga Hospital comprises of approximately 150,000 inhabitants and 15 peripheral health units (PHUs). Besides Masanga Hospital there are two other hospitals in Tonkolili district, Magburaka Hospital and Lion Heart Hospital in Yele.

Currently, there is no complete and trustworthy overview of maternal health in Tonkolili District. Therefore, a baseline assessment using the WHO Reproductive Health Indicators and the RMNCAH coverage targets is needed to work towards achieving the goal set by the Ministry.

It is hypothesized that the poor referral system is a major causative factor of the current poor maternal health situation in Tonkolili district. Perceptions of health workers at PHUs concerning the referral system of obstetric patients is necessary to identify areas of improvement.

Aims and Objectives

The aim of this research project is to do a retrospective, quantitative descriptive analysis of data collected during project to describe maternal health demography, geography, delivery and complication rates of Tonkolili district, especially in relationship to the catchment area of Masanga Hospital. Additionally, an assessment of health workers' perceptions of the current referral system of obstetric patients will be undertaken.

Research Questions

1. What is the current maternal health situation in Tonkolili District, Sierra Leone, in terms of WHO Reproductive Health Indicators and the RMNCAH coverage target matches?

The baseline assessment shall provide an overview of several WHO Reproductive Health Indicators and RMNCAH coverage targets in Tonkolili district over the period 2016-2018. Data collection will be done in the Peripheral Health Units (PHUs) and the district hospitals (Masanga Hospital, Magburaka Hospital and Lion Heart Hospital, Yele), in collaboration with the District Health Sister (DHS1), District Medical Officer (DMO) and the District Health Information System (DHIS).

The following data will be collected per health facility:

- Level of service provision (MCHP, CHP, CHC, District Hospital)
- Location in the catchment area
- Number of deliveries (spontaneous, assisted, CS)
- Number of live births
- Number of still births
- Number of maternal deaths
- Number of complications (ante partum haemorrhage (APH), postpartum haemorrhage (PPH), pregnancy-induced hypertension (PIH), pre-eclampsia, eclampsia, obstructed labour, post-partum sepsis)
- Number of referrals, reasons for referral
- Number of antenatal care visits
- Number of intermittent preventive treatment (IPT) during ANC

2. What are the perceptions of health workers at peripheral health units in the catchment area of Masanga Hospital concerning the current referral system of obstetric patients?

Perceptions of health workers working in PHUs in the catchment area of Masanga Hospital will be explored in several discussions.

The discussions will focus on the following topics:

- Communication between health centres
- Determinants of referral decision
- Actions taken before and during referral
- Effect of antenatal care on referrals
- Referral constraints

Study Design

This research project is a retrospective, quantitative descriptive analysis. Data collection will be done in collaboration with the District Health Sister (DHS1), District Medical Officer (DMO) and the DHIS.

Patients/Participants

All women that visited a PHU or hospital in Tonkolili district for antenatal care visits, health facility deliveries or pregnancy or delivery complications during the period 2016-2018 will be included in the baseline overview. Selection bias must be considered as not all pregnant women visit a health facility. Reproductive health data is available through the centralized District Health Information System. Access to the District Health Information System will be officially requested. Data is available of approximately 12,000 facility-based live births in the district per year and therefore roughly 36,000 facility-based live births in the specified period. However, it is estimated that 46% of pregnant women in Sierra Leone give birth at home². There is therefore no data available of these homebirths, but these women might have visited a health facility for antenatal care or for post-partum complications.

Health workers at PHUs in the catchment area of Masanga Hospital will be asked to participate in the group discussions focusing on their perceptions of the current obstetric referral system. Written informed consent will be obtained using the attached form. An interview guide will be used.

Statistical Methods

After centralization of the data in SPSS, a baseline overview of the variables named for research question 1 will be made for each PHU and hospital and for Tonkolili district. The qualitative data of the group discussions will be analyzed using systematic text condensation.

Results

The baseline assessment shall provide an overview of several WHO Reproductive Health Indicators and the RMNCAH coverage targets in Tonkolili district over the period 2016-2018. Regional differences in maternal health outcomes in Tonkolili District will be identified. These regional differences will be linked to the accessibility of emergency obstetric care in those regions. This baseline overview will provide a basis for further research and implementation of new interventions, aimed at reaching the goal set by the Ministry.

The perceptions of health workers at PHUs in the catchment area of Masanga Hospital will illuminate constraints of the current referral system of obstetric patients. Additionally, the quality of communication between different levels of health facilities concerning referrals will be described. Possible solutions as suggested by the health workers will be described.

The results will be summarized in a descriptive article.

Ethical Considerations

Ethical Approval

Ethical approval will be obtained from the Sierra Leone Ethics and Scientific Review Committee.

Selection of study population and recruitment of research participants

All patients registered at PHUs and hospitals in Tonkolili District for antenatal care visits, deliveries, and pregnancy complications in the period 2016-2018 are selected and included. Patients are free to refuse participation. This refusal must be apparent from the District Health Information System.

Informed consent process

Receiving medical care at a PHU or hospital implicitly indicates given consent to use of registered data for medical research through the District Health Information System. Written informed consent will be obtained from participants in the group discussions. The informed consent form is included in this application.

Risks of participation

Participation in the baseline overview exposes patients to minimal chance of harm. Participation does not include any clinical intervention. Confidentiality and anonymity of patient data is maximally safeguarded.

Participation in the group discussions exposes the health workers to minimal chance of harm. Confidentiality and anonymity of participant data is maximally safeguarded.

Inducements, financial benefits, and financial costs

Participation is not rewarded with any financial, material or healthcare service benefit.

Protection of research participants' privacy and confidentiality

Research participant data is centrally stored in the District Health Information System. This digital system is password protected. To ensure confidentiality, this data is only accessible by the head researcher and supervisors.

Group discussion participant data is stored on password-protected computers in Masanga Hospital. Only the head researcher has access to the names, functions and health facilities of the participants. Reported data is anonymous and cannot be traced back to the specific health facility.

Independence of research and conflicts of interests

Research is conducted on behalf of Masanga Hospital and in collaboration with Tonkolili District. No other parties are involved. The researchers certify that they have no conflicts of interests.

Schedule

1-8 weeks:

- Contact with DMO and DHS, attending the district meetings and the district maternal mortality meetings in Magburaka
- Application for funding
- Application for District Health Information System access

8-20 weeks

- Analysis of DHIS data
- Group discussions

20-28 weeks

- Analysis and illustration of DHIS data
- Writing descriptive article

GANTT chart

	W1-4	W5-8	W9-12	W13-16	W17-20	W20-24	W24-28
DMO/DHS contact							
Initiation visits in PHUs/Hospitals							
DHIS access application							
Group discussions							
Data analysis							
Writing							
Submitting article							

1
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3
4 **References**

- 5 1. Sierra Leone Demographic and Health Survey 2013 via the DHS Program STATcompiler.
6 (<http://www.statcompiler.com>).
7
8 2. Sierra Leone Reproductive, Maternal, Newborn, Child and Adolescent Health (RMNCAH) strategy
9 2017-2021, Ministry of Health Sierra Leone

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Participant Informed Consent Form

Study title: Perceptions of health workers at peripheral health units in the catchment area of Masanga Hospital concerning the current referral system of obstetric patients

Researcher: Ryan Proos E-mail: ryanproos9@gmail.com

Institute: Masanga Medical Research Unit, Sierra Leone

	Add your initials if you agree
I agree that this interview will be recorded and that the data will be analyzed and reported anonymously.	
I understand that I can withdraw from this study at any time, without given reason and all my data will be deleted.	
I understand I can contact the Sierra Leone Ethics and Scientific Review Committee at any time (contact details below*).	

Name of participant:

Signature: Date:

Name of person taking consent:

Signature: Date:

* Contact details Sierra Leone Ethics and Scientific Review Committee:

E-mail: efoday@health.gov.sl

** this form needs to be signed and dated in presence of the patient. If preferred, the patient will receive a copy of this form. The forms will be stored in a secure location, ensuring patients privacy.

BMJ Open

Perspectives of health workers on the referral of women with obstetric complications: a qualitative study in rural Sierra Leone

Journal:	<i>BMJ Open</i>
Manuscript ID	bmjopen-2020-041746.R1
Article Type:	Original research
Date Submitted by the Author:	02-Oct-2020
Complete List of Authors:	Proos, Ryan; Masanga Medical Research Unit; Leiden University Medical Center, Obstetrics and Gynaecology Department Matheron, Hanna; Masanga Medical Research Unit Vas Nunes, Jonathan; Masanga Medical Research Unit Falama, Abdul; Tonkolili District Health Management Team Sery Kamal, Patricia; Tonkolili District Health Management Team Grobusch, Martin; Amsterdam University Medical Centres, Center of Tropical Medicine and Travel Medicine, Department of Infectious Diseases; Masanga Medical Research Unit van den Akker, Thomas; Leiden University Medical Center, Obstetrics and Gynaecology Department; VU Amsterdam, Athena Institute
Primary Subject Heading:	Health services research
Secondary Subject Heading:	Health services research, Obstetrics and gynaecology, Public health, Qualitative research, Global health
Keywords:	Maternal medicine < OBSTETRICS, PUBLIC HEALTH, Organisation of health services < HEALTH SERVICES ADMINISTRATION & MANAGEMENT, QUALITATIVE RESEARCH

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3 1 **Perspectives of health workers on the referral of women with obstetric complications: a**
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5 2 **qualitative study in rural Sierra Leone**
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8 3 Ryan Proos^{1,3}, Hanna Mathéron^{1,2,4}, Jonathan Vas Nunes^{1,2,4}, Abdul Falama⁵, Patricia Sery
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10 4 Kamal⁵, Martin Peter Grobusch^{1,4*}, Thomas van den Akker^{3,6}
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57 20 Word count: Abstract – 294 words; Main text body - 4,528 words
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1
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3 21 **ABSTRACT**
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5

6 22 **Objectives**
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9 23 Sierra Leone has one of the highest maternal mortality ratios in the world. Timely and well-
10 24 coordinated referrals are necessary to reduce delays in providing adequate care for women
11 25 with obstetric complications. This study describes factors affecting timely and adequate
12 26 referral of women with obstetric complications in rural areas of Sierra Leone as viewed by
13 27 health workers in rural health facilities.
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22 28 **Design**
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25 29 A qualitative research with semi-structured interviews using open-ended questions. Data
26 30 were analysed by systematic text condensation.
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31 31 **Setting**
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34 32 Interviews were held in nine peripheral health units in rural Sierra Leone.
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37 33 **Participants**
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40 34 19 health workers including nurses, midwives and clinical health officers participated in nine
41 35 interviews.
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45 36 **Results**
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49 37 From the interviews, four major themes describing possible factors of delay in referral of
50 38 women in need of emergency obstetric care emerged: 1) communication between health
51 39 care workers; 2) underlying influences on decision-making; 3) women's compliance to
52 40 referral; 4) logistic constraints.
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3 41 Several factors in rural Sierra Leone are perceived to complicate timely and adequate
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5 42 referral of women in need of emergency obstetric care. Notable among these factors are
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8 43 fear among women for being referred and fear among health care workers for having
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10 44 maternal deaths or severe obstetric complications occurring at their own facilities.
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13 45 Furthermore, decision-making of health care workers whether to refer a woman or not is
14
15 46 negatively influenced by a hierarchical culture with high power distance between health care
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18 47 workers.

21 48 **Conclusion**

23
24 49 Factors identified that complicate timely and adequate referral of women in need of
25
26 50 emergency obstetric care must be considered in efforts to reduce maternal mortality.
27
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29 51 Possible interventions that may reduce delay in referral include increased communication by
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31 52 mobile phones between health workers for advice and feedback regarding referrals,
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34 53 involvement of influential stakeholders to increase women's compliance to referral, and
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36 54 consistent use of standardised management protocols.
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42 56 **ARTICLE SUMMARY**

45 57 **Strengths and limitations of this study**

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48
49 58 • A strength of this study is the purposive and homogenous sampling used for the
50
51 59 selection of peripheral health units and health workers for the interviews, which is
52
53
54 60 representative of health facilities and health workers in rural Sierra Leone.
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3 61 • A strength of this study is the use of open-ended questions alongside an interview
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5 62 guide, ensuring specific topics were discussed while allowing participants to
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8 63 introduce and discuss additional topics.
9
10 64 • A limitation of this study is that the data collected using semi-structured interviews
11
12
13 65 with health workers were not triangulated with data from interviews with women
14
15 66 and relatives.

17
18 67 **KEYWORDS**

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21 68 health worker; maternal health; obstetric complications; qualitative study; referral; Sierra
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70 BACKGROUND

71 Sierra Leone has one of the highest maternal mortality ratios (MMR) in the world. According
72 to the Sierra Leone Demographic Health survey in 2013, the MMR was 1,165 per 100,000
73 live births [1]. The need to reduce this extremely high ratio is evident. In order to work
74 towards meeting the United Nations Sustainable Development Goal target of an MMR below
75 70 per 100 000 [2], the Ministry of Health and Sanitation of Sierra Leone launched the
76 Reproductive, Maternal, Newborn, Child and Adolescent Health Strategy in 2017, aiming to
77 reduce the MMR of 1,165 to 650 by 2021 [3].

78 An underlying factor of the high MMR in Sierra Leone is the persistent low rate of facility-
79 based births [1]. Country-wide in 2013, only slightly more than half of the women gave birth
80 in a health facility; 49.7% of women in rural areas versus 68.1% in urban areas [1]. The West-
81 African Ebola outbreak from 2013 to 2016 led to a further reduction in facility-based births
82 as a consequence of reduced possibilities and fear to access the health system during the
83 crisis [4, 5].

84 Pregnant women in Sierra Leone face many barriers to facility-based birth, including long
85 distances, inability to afford costs of transport and healthcare and lack of trust in health
86 facilities [6]. These factors contribute to a phase-1 delay in deciding to seek healthcare in
87 case of an emergency obstetric complication, as described in the three-phase delay model
88 by Thaddeus and Maine [7]. Even after having decided to seek health care, women are often
89 confronted with delays in phase 2 (transport delay), and phase 3 (delay in diagnosis and
90 treatment at the facility) [8]. Shortly before this study was conducted, a new ambulance
91 system was implemented in Sierra Leone, possibly reducing transport delays. Timely and
92 well-coordinated referrals are necessary to further reduce delay in receiving adequate

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3 93 obstetric care for women with obstetric complications. Currently, there is no literature
4
5 94 available analysing aspects of reasons for delay of care within the obstetric referral system in
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8 95 rural Sierra Leone.
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11 96 This study describes factors affecting timely and adequate referral of women with obstetric
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13 97 complications in rural areas of Sierra Leone through the perspectives of health workers in
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16 98 rural health facilities. This data will provide better understanding of challenges within the
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18 99 health system faced by women who are referred with emergency obstetric complications in
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21 100 rural Sierra Leone.
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23 24 101 **METHODS**

25 26 27 102 **Study design and setting**

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30 103 This qualitative study using semi-structured interviews and following the Consolidated
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32 104 criteria for reporting qualitative research (COREQ) checklist [9] (Supplementary File 1) was
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35 105 conducted between the 1st of September 2018 and the 15th of March 2019 in Tonkolili
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37 106 District. This district is located in the Northern Province of Sierra Leone and sub-divided into
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40 107 eleven chiefdoms. Three hospitals with Comprehensive Emergency Obstetric and Neonatal
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42 108 Care are located in Tonkolili District. Basic and Comprehensive Emergency Obstetric and
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45 109 Neonatal Care (BEmONC and CEmONC) are services fundamental to provide adequate health
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47 110 care during pregnancy and childbirth. The signal functions of BEmONC and CEmONC centres
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50 111 are summarised in Supplementary File 2. Three chiefdoms in the north of Tonkolili District,
51
52 112 Kafe Simiria, Kalansogoia and Sambaya Bendugu, with a combined population of 113,521
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54
55 113 (2018), are served by two CEmONC centres, Magburaka Government Hospital and Masanga
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57 114 Hospital, an NGO-supported government hospital. Besides the two CEmONC centres, these
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59
60 115 chiefdoms are served by fifteen peripheral health units (PHUs), including four BEmONC

116 centres. The maternity services provided at each facility level in these chiefdoms, according
 117 to the Ministry of Health and Sanitation, are summarised in Table 1.

Table 1: Maternity services purportedly provided at each level of health facility

Maternal and Child Health Post (MCHP)	<ul style="list-style-type: none"> ● Antenatal care <ul style="list-style-type: none"> ○ Nutritional supplementation in pregnancy (e.g. iron, folic acid and multivitamins) ○ Risk selection and ensuing referral ○ Malaria intermittent preventive treatment ● Intra- and postpartum care <ul style="list-style-type: none"> ○ Monitoring of labour by using the partograph ○ Cord clamping ○ Active management of the third stage of labour ● Postnatal care <ul style="list-style-type: none"> ○ Clinical assessment of the neonate (e.g. fever, convulsions, feeding) ○ Exclusive breastfeeding recommendation ○ Cord care ○ Clinical assessment of mother (e.g. temperature, blood pressure, bleeding) ○ Family planning counselling
Community Health Post (CHP)	<ul style="list-style-type: none"> ● MCHP services (see above)

<p>Community Health Centre (CHC)</p>	<ul style="list-style-type: none"> • MCHP services (see above) <p><i>plus</i></p> <ul style="list-style-type: none"> • Maternal anaemia and urine sediment assessment • BEmONC services (see supplementary file 2)
<p>District Hospital</p>	<ul style="list-style-type: none"> • MCHP services (see above) <p><i>plus</i></p> <ul style="list-style-type: none"> • Maternal anaemia, urine, HIV, malaria and tuberculosis assessment • Ultrasound scan • CEmONC services (see supplementary file 2)

118 However, not all facilities designated to provide BEmONC and CEmONC in rural Sierra Leone
 119 are able to provide the full range of signal functions [10, 11]. Therefore, several BEmONC
 120 and CEmONC signal functions might not actually be provided in practice. Referral occurs
 121 both in consecutive order starting from Maternal and Child Health Posts (MCHPs) as well as
 122 between lower level health facilities and district hospitals. Sierra Leone has national
 123 protocols for emergency obstetric care, including referral indications [12].

124 Tonkolili District was conveniently selected, since the district is located in rural Sierra Leone
 125 and the catchment area of the hospital where three of the authors are employed. The
 126 chiefdoms in northern Tonkolili District were selected, since these three combined comprise
 127 the catchment area for emergency obstetric complications belonging to Masanga Hospital,
 128 for reasons of geography such as impassable rivers and mountains and accessibility by road.

129 The qualitative data used in this study was collected using nine semi-structured interviews
 130 conducted by RP (Master of Medicine student, male, first author) between November 2018

1
2
3 131 and January 2019. Purposive sampling was used to ensure variation between selected
4
5 132 facilities where interviews were conducted. Selection criteria were that facilities were
6
7
8 133 located in different chiefdoms, provided different levels of care, and had varying
9
10 134 accessibilities of the nearest district hospital (Table 2).
11
12

13
14 Table 2: Facilities where interviews were conducted
15

Town	Level	Distance to district hospital (km)	Travel time to district hospital* (min)
Chiefdom Kafe Simiria			
Mabontor	CHC	18.9	40
Masumbrie	CHC	21.5	40
Makontande	MCHP	28.9	50
Chiefdom Kalansogoia			
Bumbuna	CHC	42.6	70
Kamasaypana	MCHP	50.0	100
Kemedugu	MCHP	58.5	110
Chiefdom Sambaya Bendugu			
Bendugu	CHC	81.4	150
Kunya	CHP	92.3	180
Dankawalia	MCHP	71.9	135
* Travel time by motorbike during dry season (November – May). Travel time during rainy season (June – October) will be			

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substantially longer. Travel time by ambulance will be shorter.

Roads were unpaved.

135 Selected facilities were approached either by telephone calls to the in-charge health worker
 136 or by face-to-face visits to that health facility. All health workers working at the selected
 137 facilities at the time of the interview were invited to participate in the interview. Thus,
 138 homogenous sampling was used as each interview was conducted with health workers of
 139 different cadres currently working in the same health centre. The number of participants per
 140 interview ranged from one to four. In total, nineteen health workers participated in the nine
 141 interviews. All participants were explained the relevance and goals of the research. No
 142 facility or individual health worker refused participation. Respective health worker cadres
 143 and competencies of the participants are summarised in Table 3.

Table 3: Cadres and competencies of respondents

Health worker (number interviewed)	Competencies
Maternal and Child Health aid (MCH aid) (10)	2 years training. Competent in basic obstetric care.
State Enrolled Clinical Health Nurse (SECHN) (2)	2,5 years training. Competent in basic obstetric care.
Community Health Assistant (CHA) (3)	2 years theoretical + 1-year practical training. Competent in basic obstetric care.
Community Health Officer (CHO) (2)	3 years theoretical + 1-year practical training. Competent in basic obstetric care. No training in emergency obstetric care.

Midwife (2)	SECHN training + 1,5 year-midwifery training. Competent in emergency obstetric care including oxytocin administration, manual placenta removal, newborn resuscitation, first treatment for (pre)eclampsia and antibiotic administration. No training in remaining signal functions.
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144 The interview guide (Supplementary File 3) was used as a framework of themes to be
 145 discussed during the interviews. The guide was initially developed using themes described by
 146 Thaddeus and Maine [7], previous literature concerning pregnancy and childbirth in Sierra
 147 Leone [6, 13], and preliminary discussions with stakeholders such as medical officers,
 148 community health officers (CHO), midwives and logistical officers employed at district
 149 referral hospitals. The guide was piloted in one PHU with two health workers. The interviews
 150 were held inside the respective health facilities where only participants and interviewer
 151 were present. The interviews were conducted in English, using open-ended questions, and
 152 lasted between 30 and 60 minutes each. Data was collected using audio recording. Repeat
 153 interviews were not carried out and transcripts were not returned to participants for
 154 comments and correction for logistical reasons: there was no funding or practical possibility
 155 to re-visit these widely spread-out facilities. The original study protocol (Supplementary File
 156 4) was followed throughout the study.

157 **Study Subject and Public involvement**

158 The District Health Management Team was involved in the design, conduct, reporting and
 159 dissemination planning of our research. All participants of the interviews were informed on
 160 relevance and goals of the study.

161 **Analysis**

162 All audio recordings of interviews were transcribed verbatim by RP using Express Scribe
163 Transcription Software (NCH Software, Greenwood Village, Colorado, USA). Content analysis
164 was performed by RP through systematic text condensation as described by Malterud [14].
165 After all interviews were transcribed verbatim, all transcripts were read multiple times to
166 establish an overview of the data. Preliminary themes were identified based on this
167 overview. Hereafter, all transcripts were once again reviewed line by line, to identify
168 'meaning units', i.e. text fragments containing some information about the research
169 question. These meaning units were marked with a code: a label that connects related
170 meaning units into a code group. These code groups were elaborated from the themes from
171 the first step of the analysis. Hereafter, the meaning units in each code group were
172 connected to form a condensate. Lastly, these condensates were synthesized to accurately
173 reflect the original quotes and some original quotes were included in the text to further
174 illustrate the data. Data analysis was performed manually. HM was involved in the whole
175 process of data analysis and gave feedback on the identification of the preliminary themes,
176 the systematic coding and categorisation of quotes, and the writing of condensates of every
177 theme based on the quotes.

178 **Ethical Considerations**

179 The study proposal was endorsed by the Masanga Medical Research Unit Scientific Review
180 Committee. Ethical approval was obtained from the Sierra Leone National Ethics and
181 Scientific Review Committee on 29 January 2019. Permission to conduct the study in
182 Tonkolili District was obtained from the District Health Management Team. Written
183 informed consent was obtained from interview participants.

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2
3 184 **RESULTS**
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5

6 185 From these interviews, four major themes describing possible factors of delay in referral of
7
8 186 women in need of emergency obstetric care emerged: 1) communication between health
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11 187 care workers, 2) underlying influences on decision making, 3) women's compliance to
12
13
14 188 referral, 4) logistic constraints.
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16
17 189 **1) Importance of communication between staff of different health centres**
18

19
20 190 **Giving and receiving advice surrounding referrals.** Most health workers mentioned the
21
22 191 necessity of asking for advice when having to decide whether to continue management or
23
24 192 refer the woman to a higher-level health centre. One community health assistant (CHA)
25
26
27 193 explains:
28
29

30 194 *"I am not saying 100% I know what I am doing. I know myself. I learn, I can just know*
31
32 195 *my own area and then there are people who know better. I am just a community*
33
34 196 *health officer, assistant in fact."* (male CHA, MCHP)
35
36
37

38 197 Advice was often asked for and given in mobile phone conversations. However, sometimes
39
40 198 higher cadre health workers travelled to health facilities to review women themselves
41
42
43 199 before advice was given.
44
45

46 200 *"Sometimes he will come and he will review the patient and tell us to send the*
47
48 201 *patient, so we call the ambulance."* (female MCH aid, CHP)
49
50

51 202 Those asked for advice include CHOs, midwives, the District Health Sisters (supervising
52
53 203 midwives, members of the Tonkolili District Health Management Team), the head of a
54
55 204 maternity ward or a medical officer at a district hospital. However, one maternal and child
56
57
58 205 health aid (MCH aid) mentioned that if she recognized a woman requiring urgent referral to
59
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1
2
3 206 a higher-level facility, she would not delay by first calling for advice but rather directly refer
4
5 207 the woman to the community health centre (CHC). She would not, however, directly refer
6
7
8 208 the woman to a district hospital or inform the CHC that this woman likely needed onward
9
10 209 referral, since she believed that this decision had to be made by CHC staff.

11
12
13 210 Besides needing advice on whether or not to refer the woman to a higher-level facility,
14
15 211 participants also mentioned a need for advice over the phone regarding clinical
16
17
18 212 management while waiting for the ambulance to arrive, since this could take up to several
19
20
21 213 hours.

22
23
24 214 **Feedback after referral.** Many health workers indicated that they were interested in the
25
26 215 clinical course after a woman had been referred to the district hospital, as illustrated by one
27
28
29 216 CHO:

30
31
32 217 *"We are highly interested in feedback, because they are lives and when we call on you*
33
34 218 *people to rescue, then we have interest over them."* (male CHA, CHC)

35
36
37 219 Health workers in lower level facilities expressed a specific interest in knowing the clinical
38
39
40 220 management including decisions on mode of birth at the district hospital. These health
41
42 221 workers were often approached by relatives of the referred woman requesting updates on
43
44
45 222 her clinical condition and outcome. Health workers regularly marked their phone numbers
46
47 223 on the referral notes in order to receive feedback. However, many respondents complained
48
49
50 224 never receiving a response from district hospital staff. Instead, they felt forced to call the
51
52 225 district hospital themselves, and indicated this comprised a communication barrier, since it
53
54
55 226 required them to spend their own mobile phone credits.

56
57
58 227 *"But they don't give us the feedback for us to know if it was a vacuum delivery or*
59
60 228 *what. I have no response..."* (female MCH aid, MCHP)

1
2
3 229 Similarly, health workers complained of never receiving discharge notes with follow-up
4
5 230 information after the woman had been discharged from the district hospital. They generally
6
7
8 231 relied on the information the woman could give them verbally.
9

10 11 232 **2) Underlying influences on decision-making**

12
13
14 233 **Referral, perceived as the safest option for health workers.** The necessity of referral, as
15
16 234 expressed by one health worker, was often to avoid complications and maternal death
17
18
19 235 occurring at their own facility.
20

21
22 236 *“If a maternal death is here, we are going to suffer.”* (female SECHN, MCHP)
23

24
25 237 Often, a referred woman was described as ‘not my case’. Another health worker mentioned
26
27 238 that when a woman was referred to a CHC, it was up to that facility to manage the woman
28
29 239 with the complication and decide what to do. Such transfer of responsibility after referral
30
31 240 was further illustrated by a story recounted by an MCH aid about a woman she had recently
32
33 241 referred:
34
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37
38 242 *“Yes, I delivered her. Male baby. Fresh still birth. So it is not my problem, because I*
39
40 243 *have already referred her.”* (female MCH aid, MCHP)
41
42

43
44 244 **Endangering behaviour by women requiring referral.** Some women did not want to be
45
46 245 referred and health workers were under a lot of pressure from women and relatives while
47
48 246 making a referral decision. Women and relatives were at times perceived not to tell the
49
50 247 truth when questioned about history, since they wanted to prevent referral. One health
51
52 248 worker mentioned that he sometimes heard rumours in the community that the point in
53
54 249 time a woman and her relatives indicated as when onset of symptoms occurred was not
55
56 250 always correct.
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3 251 *“Nothing of the time stated was really factual, it was not the time, the actual time.”*

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5
6 252 (male CHA, MCHP)

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8
9 253 Most respondents described that when a woman and her relatives were told that she
10
11 254 needed to be referred, they started begging health workers not to refer her but to continue
12
13 255 clinical management at the same facility. Women and relatives would try to convince them
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15
16 256 that they, as health workers, would be able to manage the woman with the complication
17
18 257 without referral. One SECHN stated:

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21 258 *“They will want us to do everything while we don't have that ability.”* (female SECHN,

22
23
24 259 CHC)

25
26
27 260 A CHA voiced his frustration at the women's and relatives' behaviour and stated that it
28
29 261 endangered his own work.

32 33 262 **3) Women's compliance with referral**

34
35
36 263 **Influential stakeholders involved to improve compliance.** Referral to a district hospital was
37
38 264 perceived to come with many fears and worries for a pregnant woman. Examples mentioned
39
40 265 by health workers included fear of undergoing surgery, viral haemorrhagic fever (Ebola or
41
42 266 Lassa virus) infection, blood donation, male health workers and an unfamiliar environment
43
44
45 267 in terms of language and people. Such fears contributed to women returning home instead
46
47
48 268 of travelling to the health centre they were referred to. Respondents identified three
49
50 269 influential stakeholders who may potentially reduce fears around referral. The first
51
52 270 stakeholder was the chief of the village or town, whose advice and instruction were of
53
54
55 271 substantial influence on the women's and relatives' referral compliance.

1
2
3 272 *"My chief is not staying that far from me. So sometimes I call him when there is a*
4
5 273 *case, when there is need for him to come here, as stakeholder, that he can talk to this*
6
7
8 274 *person."* (male CHA, MCHP)
9

10
11 275 The second group of stakeholders, recognised by health workers as similarly influential,
12
13 276 consisted of relatives in Freetown, the capital of Sierra Leone. One state-enrolled community
14
15
16 277 health nurse (SECHN) stated:

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18
19 278 *"They will always listen to their relatives out there."* (female SECHN, MCHP)
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21

22 279 These relatives in Freetown were contacted and requested to attempt to convince the
23
24 280 woman of the necessity of the referral and to adhere to the referral instructions. Finally,
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26
27 281 according to the health workers, women who had previously been referred to a district
28
29 282 hospital and returned safely had a positive influence on a woman's perceptions regarding
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31
32 283 referrals to district hospitals.
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35 284 **4) Logistical constraints**

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38 285 **Medicine shortage as a burden on the referral system.** The logistical constraints of dealing
39
40 286 with stockouts of medication in PHUs comprised an additional burden on the referral
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43 287 system. Many health workers, especially those working in CHCs, complained of struggling
44
45 288 with medication shortages. Injectable antibiotics were often mentioned as insufficient for
46
47
48 289 the purposed term.
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51 290 *"But medication, logistics, is much more paramount. We need IV fluids, we need*
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53 291 *drugs."* (male CHA, CHC)
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56 292 When medication stocks had been exhausted, the health worker was faced with two
57
58
59 293 options. The first option was to request money from the woman to purchase medication at a
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3 294 local pharmacy. One health worker described the friction this created with the Free Health
4
5 295 Care Scheme for pregnant and lactating women, since it was by law illegal to request money
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7
8 296 from these women.
9

10
11 297 *“I am not going to ask her to pay for the service I am rendering but just to provide the*
12
13 298 *drug. But me that is punishable crime, I cannot... Then I be in fault.”* (male CHA, CHC)
14

15
16 299 However, sending a woman directly to the pharmacy to buy medication themselves was not
17
18 300 safe according to several health workers. They expressed their distrust in local pharmacists
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20 301 as they suspected them of not being properly trained and sometimes giving the wrong
21
22 302 medication as well as administering injectable drugs themselves against regulations.
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26
27 303 Health workers were therefore often forced to resort to referral to a district hospital in order
28
29 304 for a woman to access the correct medication. The CHA voiced his desperation:
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31
32 305 *“So what would you do? You just have to refer.”* (male CHA, CHC)
33
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35
36 306 He also expressed his worry about the reaction from the district hospital after receiving such
37
38 307 referrals. He feared that the district hospital would doubt the competency of the health
39
40 308 workers at the PHU referring a woman who could potentially be managed at their own
41
42 309 facility. Finally, some respondents pointed out that referring such a woman exposed them to
43
44 310 additional adverse outcomes such as the relatives falling back on traditional medicine or
45
46 311 going to a local pharmacy, since this was cheaper than paying for referral transportation.
47
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51 312 **Inadequate ambulance availability.** Tonkolili District has a limited number of ambulances
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53 313 available for the transport of women with emergency obstetric complications. Many health
54
55 314 workers complained about the fact that when they call for an ambulance, they are told that
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1
2
3 315 the ambulance has broken down or to wait since the ambulance is on its way to a different,
4
5 316 sometimes very distant PHU.

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9 317 *“If you call the ambulance, at times the ambulance takes three to four hours before*
10
11 318 *arriving here.”* (male CHO, CHC)

12
13
14 319 It was also noted that it sometimes takes a long time before the ambulance team, comprised
15
16 320 of a driver and a nurse, is mobilised at the district hospital and the ambulance is finally under
17
18 321 way. One CHA summarised the problem as:

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21
22 322 *“So sometimes it’s very difficult; the time the ambulance is here, the patient is*
23
24 323 *seriously in a critical condition.”* (male CHA, CHC)

25
26
27 324 Another problem reported was the road accessibility of certain PHUs. Some of these PHUs
28
29 325 can only be reached by motorbike and on foot. Accessibility is worse during rainy season.
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31 326 Ambulance transport during the rainy season was even stated to be not possible at all for
32
33 327 several PHUs.

34 35 36 37 38 328 **DISCUSSION**

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40
41 329 This study highlights several aspects of the obstetric referral system in rural Sierra Leone,
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43 330 which require attention in order to provide timely and adequate management of women
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45 331 with emergency obstetric complications.

46 47 48 49 332 **Importance of communication between staff of different health centres**

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51
52 333 The importance of communication between health centres to achieve an effective referral
53
54 334 system was widely acknowledged by participating providers. Health care workers generally
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56 335 concurred with each other on the advantages of receiving advice on whether to continue
57
58 336 management, or to refer a woman instead. However, our findings concerning the practice of

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2
3 337 waiting for a higher-cadre health worker from a different health facility to arrive and
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5
6 338 personally examine the woman before advising on a referral decision, are in disagreement
7
8 339 with protocol and would increase type 2 delay. This delay can be largely abated by adequate
9
10 340 use of mobile phones to communicate with higher-cadre health workers for advice regarding
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12
13 341 referral decisions [15], as well as further education for MCH aids who will not need a second
14
15 342 opinion anymore. Furthermore, the reluctance of lower-cadre health workers in referring
16
17 343 women directly to a district hospital and thereby bypassing the higher-cadre health worker's
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19 344 judgment as well as the reluctance of referring women to a CHC with the advice to further
20
21 345 refer to a district hospital reveal potentially harmful hierarchy between health workers.
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23
24 346 From Tanzania, Ueno et al. reported a similar atmosphere of hierarchy and lack of
25
26 347 cooperation between different cadres of health workers and levels of health facilities as a
27
28 348 challenge to EmOC service delivery [16].
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32
33 349 Our findings also imply that following referral, district hospitals need to take initiative in
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35 350 providing health workers in PHUs with feedback in order to improve and encourage future
36
37 351 referrals and follow-up management of the woman after discharge from the district hospital.
38
39
40 352 Studies in Ghana, Burundi and Northern Uganda reported similar demands for feedback
41
42 353 after referral [17-19]. Multiple other studies have described related gaps in communication
43
44 354 surrounding obstetric referrals [20, 21] and have specified the critical role of communication
45
46 355 in an effective referral system [21-24]. Improvement in communication between health
47
48 356 facilities and health workers is a necessary first step towards improving the referral system
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50 357 in northern Tonkolili District.
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54 55 358 **Underlying influences on decision-making**

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3 359 Our findings point at a mindset of some health workers regarding obstetric referrals that has
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6 360 potential adverse effects on timely management of women with emergency obstetric
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8 361 complications. Maternal mortality and morbidity were seen as tragic events for women and
9
10 362 relatives, but also alarming for themselves as health workers. Referral and the ensuing
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13 363 transfer of responsibility was regarded as an option to prevent themselves from being
14
15 364 blamed in case of a complication. It is hypothesised that this mind-set is an adverse result of
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17
18 365 the increased awareness of, and attention to, the high maternal mortality and morbidity
19
20 366 rates in Sierra Leone. Obstetric audits have been proven to be an effective method of
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22
23 367 reducing maternal mortality and morbidity [25-27], but a negative impact on work
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25 368 satisfaction and motivation have also been reported [27, 28]. However, our findings provide
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27
28 369 limited evidence and further research in rural Sierra Leone is essential to accurately analyse
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30 370 this information.

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32
33 371 Another underlying influence which became apparent throughout the interviews was the
34
35 372 persuasiveness of women and relatives who did not want to be referred to a different health
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37
38 373 facility. Such persuasiveness has potential to delay the referral decision made by a health
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40 374 worker and thus results in phase 1 and phase 2 delays. Also, it may lead to over-confidence
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43 375 of lower-cadre health workers respecting their ability in managing women with obstetric
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45 376 complications, as has been previously reported in Sierra Leone by Theuring et al. [13].

47 48 377 **Improving women's compliance with referral**

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50
51 378 Fears experienced by women, as reported by health workers, to accept referral to a district
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53
54 379 hospital such as fear of operations, blood donation, male health workers conducting births,
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56 380 and a new environment were largely similar to those previously reported by multiple studies
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58
59 381 in similar settings [17, 19, 29, 30]. A lingering fear of Ebola in district hospitals in post-Ebola
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3 382 regions including Sierra Leone has been described by several other studies [13, 31, 32].
4

5 383 Three groups of influential stakeholders were identified: local village chiefs, relatives in the
6
7
8 384 capital, Freetown; and women who have previously been referred to a district hospital and
9
10 385 have returned safely. Consulting these stakeholders in case of referral refusal will potentially
11
12 386 increase women's compliance. These stakeholders are understood to be similarly influential
13
14
15 387 in all rural areas of Sierra Leone.
16

17 18 388 **Logistical constraints** 19

20
21 389 The influence of medication shortage in PHUs on the effectiveness of the referral system
22
23 390 becomes apparent through our findings. The combined effect of the Free Health Care
24
25 391 Scheme [33] and the distrust in local pharmacies forces health workers into avoidable
26
27 392 referrals to district hospitals. In turn, these referrals lead women to a choice of options from
28
29 393 traditional medication or buying medication from a local pharmacy. The shortage of
30
31 394 medication in PHUs is a burden on and complicating factor of the referral system in northern
32
33 395 Tonkolili District; however, adequate availability of medication should not avert mandatory
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35 396 referrals of women with obstetric complications, which require management in district
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37 397 hospitals.
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44 398 The shortage of ambulances for transport of women from lower-level health facilities to
45
46 399 district hospitals is a commonly reported contributor to phase 2 delay in sub-Saharan Africa
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48 400 [17-19, 34, 35]. Our findings show that this barrier to access to adequate emergency
49
50 401 obstetric care is also present in rural Sierra Leone. The inability of ambulances to reach
51
52 402 certain PHUs, due to arduous terrain such as steep hills and river crossings and poor road
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54 403 conditions, worsened by seasonal rains, displays the poor infrastructure of rural Sierra
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56 404 Leone.
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3 405 In February 2019, after our data collection was completed, the Ministry of Health and
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5 406 Sanitation of Sierra Leone and the non-governmental organisation Doctors with Africa
6
7 407 CUAMM launched the National Emergency Medical Service (NEMS), which provides free-of-
8
9 408 charge ambulance service in all of Sierra Leone. The implementation of the NEMS allows for
10
11 409 imperative reduction in delay in access to adequate emergency obstetric care in district
12
13 410 hospitals. This reduction in delay is possible as the number of functioning ambulances is
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15 411 increased, and as the travel time is decreased as soon as the ambulances are not only
16
17 412 stationed in district hospitals any longer, but also in PHUs.
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23 413 **Strengths and Limitations**

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25
26 414 A strength of this study is the selection of PHUs and health workers for the interviews, which
27
28 415 is representative of health facilities and health workers in rural Sierra Leone. Therefore,
29
30 416 interventions targeting the obstetric referral system in other areas of rural Sierra Leone can
31
32 417 be supported by our findings. Another strength is the use of open-ended questions during
33
34 418 the interviews, which allowed the participants to express their own experiences and feelings.
35
36 419 Additionally, as this study was conducted before the implementation of the NEMS, this study
37
38 420 allows for a follow-up study analysing the effect of the NEMS. The authors hypothesise that
39
40 421 only the themes 'communication' and 'logistical constraints' have been affected by the
41
42 422 NEMS.
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49 423 A limitation of this study was that the data collected using semi-structured interviews with
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51 424 health workers were not triangulated with data from women and their relatives. However,
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53 425 results from previously conducted research concerning the perspectives of women and their
54
55 426 relatives have been discussed to further validate our data. Additionally, a description of the
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3 427 major reasons of referral would have been of added value to our manuscript. Lastly, the
4
5 428 interviews were conducted in English while the participants were more familiar with Krio.

6 7 8 9 429 **CONCLUSION**

10
11 430 In the perspectives of health care workers, delay in access to adequate emergency obstetric
12
13 431 care is caused by lack of communication between health workers at different facilities, lack
14
15 432 of involvement of influential stakeholders, medication shortage and lack of ambulance
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17 433 services. Of note, fear among women and their relatives for them to be referred is another
18
19 434 cause of delay. Furthermore, the decision-making of health care workers concerning referral
20
21 435 is negatively influenced by an atmosphere of hierarchy and fear of having maternal deaths
22
23 436 and other severe complications at their facility.

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28
29 437 Interventions that may reduce delay in access to adequate emergency obstetric care include
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31 438 communication by mobile phones for advice regarding referral decisions and for feedback
32
33 439 after a referral decision has been made. Involvement of influential stakeholders to increase
34
35 440 women's compliance to referral is an additional intervention that may be considered.
36
37 441 Additionally, consistent use of a standardised management protocol at the different levels of
38
39 442 health facilities may reduce delay in access to emergency obstetric care.
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45 443 This study highlights factors that may complicate timely and adequate referral of women in
46
47 444 need of emergency obstetric care. As this delay is an underlying cause of the high MMR in
48
49 445 rural Sierra Leone, these potential sources and causes of delay must be considered in efforts
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51 446 to reduce maternal mortality.
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55 447 **LIST OF ABBREVIATIONS**

56
57
58 448 MMR: Maternal Mortality Ratio;
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3 449 BEmONC: Basic Emergency Obstetric and Neonatal Care;
4
5
6 450 CEmONC: Comprehensive Emergency Obstetric and Neonatal Care;
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9 451 MCHP: Maternal and Child Health Post;
10
11
12 452 CHP: Community Health Post;
13
14
15 453 CHC: Community Health Centre;
16
17
18 454 PHU: Peripheral Health Unit;
19
20
21 455 CHO: Community Health Officer;
22
23
24 456 CHA: Community Health Assistant;
25
26
27 457 SECHN: State-Enrolled Community Health Nurse;
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30 458 MCH-aid: Maternal and Child Health Aid;
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34 459 NEMS: National Emergency Medical Service
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37 460 **DECLARATIONS**

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40 461 **Ethics approval and consent to participate**

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42
43 462 The study proposal was endorsed by the Masanga Medical Research Unit Scientific Review
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45 463 Committee. Ethical approval was obtained from the Sierra Leone Ethics and Scientific Review
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47 464 Committee. Permission to conduct the study in Tonkolili District was obtained from the
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49 465 District Health Management Team. Written informed consent was obtained from interview
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52 466 participants.
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56 467 **Data availability**
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3 468 The datasets used and/or analysed during the current study are available from the
4
5 469 corresponding author on reasonable request.
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8 470 **Competing Interests**

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11 471 All authors declare that they have no competing interests.
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23 475 **Author Contributions**

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25
26 476 RP carried out the field work, analysed the data and wrote the first draft of the paper. HM
27
28 477 and JvN conceived the study and contributed to phrasing the study question, data
29
30 478 interpretation and writing of the paper. AF, PSK and MPG contributed to data interpretation
31
32 479 and writing of the paper. Tvda oversaw the conduct of the study and contributed to data
33
34 480 interpretation and writing of the paper. All authors have contributed to the writing of, and
35
36 481 approved the final version of the paper.
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SUPPLEMENTARY FILE 1

COREQ checklist of reporting

Topic	Item No.	Guide Questions/Description	Reported on Page No.
Domain 1: Research team and reflexivity			
<i>Personal characteristics</i>			
Interviewer/facilitator	1	Which author/s conducted the interview or focus group?	8
Credentials	2	What were the researcher's credentials? E.g. PhD, MD	8
Occupation	3	What was their occupation at the time of the study?	8
Gender	4	Was the researcher male or female?	8
Experience and training	5	What experience or training did the researcher have?	8
<i>Relationship with participants</i>			
Relationship established	6	Was a relationship established prior to study commencement?	10
Participant knowledge of the interviewer	7	What did the participants know about the researcher? e.g. personal goals, reasons for doing the research	10
Interviewer characteristics	8	What characteristics were reported about the interviewer/facilitator? e.g. Bias, assumptions, reasons and interests in the research topic	10
Domain 2: Study design			
<i>Theoretical framework</i>			
Methodological orientation and Theory	9	What methodological orientation was stated to underpin the study? e.g. grounded theory, discourse analysis, ethnography, phenomenology, content analysis	12
<i>Participant selection</i>			
Sampling	10	How were participants selected? e.g. purposive, convenience, consecutive, snowball	9, 10
Method of approach	11	How were participants approached? e.g. face-to-face, telephone, mail, email	10
Sample size	12	How many participants were in the study?	10
Non-participation	13	How many people refused to participate or dropped out? Reasons?	10
<i>Setting</i>			
Setting of data collection	14	Where was the data collected? e.g. home, clinic, workplace	8, 10, 11
Presence of non-participants	15	Was anyone else present besides the participants and researchers?	11
Description of sample	16	What are the important characteristics of the sample? e.g. demographic data, date	6, 10
<i>Data collection</i>			
Interview guide	17	Were questions, prompts, guides provided by the authors? Was it pilot tested?	11
Repeat interviews	18	Were repeat interviews carried out? If yes, how many?	11
Audio/visual recording	19	Did the research use audio or visual recording to collect the data?	11
Field notes	20	Were field notes made during and/or after the interview or focus group?	N/A
Duration	21	What was the duration of the interviews or focus group?	11
Data saturation	22	Was data saturation discussed?	N/A
Transcripts returned	23	Were transcripts returned to participants for comment and/or correction?	11

Topic	Item No.	Guide Questions/Description	Reported on Page No.
Domain 3: analysis and findings			
<i>Data analysis</i>			
Number of data coders	24	How many data coders coded the data?	12
Description of the coding tree	25	Did authors provide a description of the coding tree?	12
Derivation of themes	26	Were themes identified in advance or derived from the data?	12
Software	27	What software, if applicable, was used to manage the data?	12
Participant checking	28	Did participants provide feedback on the findings?	11
<i>Reporting</i>			
Quotations presented	29	Were participant quotations presented to illustrate the themes/findings? Was each quotation identified? e.g. participant number	13-19
Data and findings consistent	30	Was there consistency between the data presented and the findings?	24
Clarity of major themes	31	Were major themes clearly presented in the findings?	13
Clarity of minor themes	32	Is there a description of diverse cases or discussion of minor themes?	N/A

Developed from: Tong A, Sainsbury P, Craig J. Consolidated criteria for reporting qualitative research (COREQ): a 32-item checklist for interviews and focus groups. *International Journal for Quality in Health Care*. 2007. Volume 19, Number 6: pp. 349 – 357

SUPPLEMENTARY FILE 2**Signal functions of BEmONC and CEmONC**

Basic Emergency Obstetric and Neonatal Care (BEmONC)

1. Parenteral treatment of infections (antibiotics)
2. Parenteral treatment of severe pre-eclampsia/eclampsia (e.g., MgSO₄)
3. Treatment of PPH (e.g., uterotonics)
4. Manual vacuum aspiration of retained products of conception
5. Assisted vaginal delivery (e.g., vacuum-assisted delivery)
6. Manual removal of placenta
7. New-born resuscitation

Comprehensive Emergency Obstetric and Neonatal Care (CEmONC)

All components of BEmONC, plus

1. Surgical capability, including anaesthesia (e.g., Caesarean Section)
2. Blood transfusion

SUPPLEMENTARY FILE 3**Interview Guide Obstetric Referral System Northern Tonkolili District**

General

1. Describe the catchment area of this health facility (number of villages, terrain).
2. Describe this health facility (number and competency of staff, average number of births and referrals).
3. Describe the referral options of this health facility (nearest health facility, nearest CHC, nearest district hospital).

Authorisation

4. Which of the staff is allowed to decide to refer women to another facility?
5. Is there always staff present that is allowed to independently refer women?
6. Does the CHO or midwife in the CHC have to be contacted before referring a woman to another facility?

Referral Process

7. Describe the steps taken when referring a pregnant or post-partum women.
8. Describe how/if referral notes are used in this health facility.
9. Describe the benefit of referral notes.
10. Describe how/if feedback is received from the referral facility.
11. Describe how/if advice is obtained from other health workers before referral.
12. Describe how/if national guidelines are used for referring a woman.
13. Describe how/if maternity patients without an emergency indication are referred to a different health facility.

Accessibility

14. Describe the accessibility of Magburaka Government Hospital from here.
15. Describe the accessibility of Masanga Hospital from here.
16. If you were to refer 10 women to a hospital, how many of them do you think will actually arrive at the hospital?
17. Describe some reasons why referred women sometimes refuse referral.
18. Describe transportation options available for referral.

Ambulance Referrals

19. Describe the process of ordering an ambulance from Magburaka Government Hospital.
20. Describe the process of ordering an ambulance from Masanga Hospital.
21. How many times have you ordered an ambulance in the past month?
22. How long does it take for the ambulance to arrive at your health facility after you have ordered the ambulance? (from Magburaka/Masanga)
23. Which of the staff is allowed to order an ambulance?
24. Is there always staff present that is allowed to order an ambulance?

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3 25. Does the CHO or midwife in the CHC have to be contacted before ordering an
4 ambulance?
5
6 26. Is transferral by ambulance free for the woman?
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8 27. Describe problems with the current ambulance referral system.
9
10 28. Describe recommendations for improving the ambulance referral system.

11 ANC/under 5

- 12 29. Describe the antenatal care in this health facility (frequency of ANC-days, number of
13 women)
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15 30. Describe how/if governmental Maternity Record Cards are used during ANC visits,
16 delivery and postnatal checks.
17

18 Masanga Hospital

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20 31. Describe recommendations for improving the health care at Masanga Hospital.
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22 32. Is Masanga Hospital an official referral hospital in Tonkolili District?
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24 33. Is healthcare free for pregnant and lactating women and children under 5 at
25 Masanga Hospital?
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SUPPLEMENTARY FILE 4

Original study protocol

Includes protocol regarding quantitative research which is not included in submitted article

For peer review only

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3 **The current situation of maternal health in Tonkolili District and the**
4 **perceptions of health workers at peripheral health units in the catchment**
5 **area of Masanga Hospital concerning the current referral system of obstetric**
6 **patients**
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For peer review only

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Background

Sierra Leone is one of the most dangerous countries for women to be pregnant and to give birth. According to the Sierra Leone Demographic Health Survey (2013)¹, Sierra Leone has a maternal mortality ratio (MMR) of 1,165 per 100,000 live births, the highest in the world and more than six times the global average. The UN Sustainable Development Goals (SDGs), adopted in 2015, aim for a reduction of the global maternal mortality ratio to less than 70 per 100,000 live births in 2030. In line with these SDGs, the Ministry of Health and Sanitation of Sierra Leone launched the Reproductive, Maternal, Newborn, Child and Adolescent Health (RMNCAH) Strategy in 2017, which aims for a reduction of preventable deaths of women, children and adolescents and ensuring their well-being². The target is to reduce the MMR of 1,165 per 100,000 live births to 650 per 100,000 live births by 2021. With launching this strategy, the government acknowledges the need for change, but there is still a long way to go to achieve this goal.

Masanga Hospital is situated in Tonkolili district, centrally located in the Northern Province of Sierra Leone. The catchment area of Masanga Hospital comprises of approximately 150,000 inhabitants and 15 peripheral health units (PHUs). Besides Masanga Hospital there are two other hospitals in Tonkolili district, Magburaka Hospital and Lion Heart Hospital in Yele.

Currently, there is no complete and trustworthy overview of maternal health in Tonkolili District. Therefore, a baseline assessment using the WHO Reproductive Health Indicators and the RMNCAH coverage targets is needed to work towards achieving the goal set by the Ministry.

It is hypothesized that the poor referral system is a major causative factor of the current poor maternal health situation in Tonkolili district. Perceptions of health workers at PHUs concerning the referral system of obstetric patients is necessary to identify areas of improvement.

Aims and Objectives

The aim of this research project is to do a retrospective, quantitative descriptive analysis of data collected during project to describe maternal health demography, geography, delivery and complication rates of Tonkolili district, especially in relationship to the catchment area of Masanga Hospital. Additionally, an assessment of health workers' perceptions of the current referral system of obstetric patients will be undertaken.

Research Questions

1. What is the current maternal health situation in Tonkolili District, Sierra Leone, in terms of WHO Reproductive Health Indicators and the RMNCAH coverage target matches?

The baseline assessment shall provide an overview of several WHO Reproductive Health Indicators and RMNCAH coverage targets in Tonkolili district over the period 2016-2018. Data collection will be done in the Peripheral Health Units (PHUs) and the district hospitals (Masanga Hospital, Magburaka Hospital and Lion Heart Hospital, Yele), in collaboration with the District Health Sister (DHS1), District Medical Officer (DMO) and the District Health Information System (DHIS).

The following data will be collected per health facility:

- Level of service provision (MCHP, CHP, CHC, District Hospital)
- Location in the catchment area
- Number of deliveries (spontaneous, assisted, CS)
- Number of live births
- Number of still births
- Number of maternal deaths
- Number of complications (ante partum haemorrhage (APH), postpartum haemorrhage (PPH), pregnancy-induced hypertension (PIH), pre-eclampsia, eclampsia, obstructed labour, post-partum sepsis)
- Number of referrals, reasons for referral
- Number of antenatal care visits
- Number of intermittent preventive treatment (IPT) during ANC

2. What are the perspectives of health workers at peripheral health units in the catchment area of Masanga Hospital concerning the current referral system of women with obstetric complications?

Perspectives of health workers working in PHUs in the catchment area of Masanga Hospital will be explored in several interviews.

The discussions will focus on the following topics:

- Communication between health centres
- Determinants of referral decision
- Actions taken before and during referral
- Effect of antenatal care on referrals
- Referral constraints

Study Design

This research project is a retrospective, quantitative descriptive analysis. Additionally, a qualitative analysis will be done using interviews. Data collection will be done in collaboration with the District Health Sister (DHS1), District Medical Officer (DMO) and the DHIS.

Patients/Participants

All women that visited a PHU or hospital in Tonkolili district for antenatal care visits, health facility deliveries or pregnancy or delivery complications during the period 2016-2018 will be included in the baseline overview. Selection bias must be considered as not all pregnant women visit a health facility. Reproductive health data is available through the centralized District Health Information System. Access to the District Health Information System will be officially requested. Data is available of approximately 12,000 facility-based live births in the district per year and therefore roughly 36,000 facility-based live births in the specified period. However, it is estimated that 46% of pregnant women in Sierra Leone give birth at home². There is therefore no data available of these homebirths, but these women might have visited a health facility for antenatal care or for post-partum complications.

Health workers at PHUs in the catchment area of Masanga Hospital will be asked to participate in the interviews focusing on their perceptions of the current obstetric referral system. Written informed consent will be obtained using the attached form. An interview guide will be used.

Statistical Methods

After centralization of the data in SPSS, a baseline overview of the variables named for research question 1 will be made for each PHU and hospital and for Tonkolili district. The qualitative data of the group discussions will be analyzed using systematic text condensation.

Results

The baseline assessment shall provide an overview of several WHO Reproductive Health Indicators and the RMNCAH coverage targets in Tonkolili district over the period 2016-2018. Regional differences in maternal health outcomes in Tonkolili District will be identified. These regional differences will be linked to the accessibility of emergency obstetric care in those regions. This baseline overview will provide a basis for further research and implementation of new interventions, aimed at reaching the goal set by the Ministry.

The perceptions of health workers at PHUs in the catchment area of Masanga Hospital will illuminate constraints of the current referral system of obstetric patients. Additionally, the quality of communication between different levels of health facilities concerning referrals will be described. Possible solutions as suggested by the health workers will be described.

The results will be summarized in a descriptive article.

Ethical Considerations

Ethical Approval

Ethical approval will be obtained from the Sierra Leone Ethics and Scientific Review Committee.

Selection of study population and recruitment of research participants

All patients registered at PHUs and hospitals in Tonkolili District for antenatal care visits, deliveries, and pregnancy complications in the period 2016-2018 are selected and included. Patients are free to refuse participation. This refusal must be apparent from the District Health Information System.

Informed consent process

Receiving medical care at a PHU or hospital implicitly indicates given consent to use of registered data for medical research through the District Health Information System. Written informed consent will be obtained from participants in the group discussions. The informed consent form is included in this application.

Risks of participation

Participation in the baseline overview exposes patients to minimal chance of harm. Participation does not include any clinical intervention. Confidentiality and anonymity of patient data is maximally safeguarded.

Participation in the group discussions exposes the health workers to minimal chance of harm. Confidentiality and anonymity of participant data is maximally safeguarded.

Inducements, financial benefits, and financial costs

Participation is not rewarded with any financial, material or healthcare service benefit.

Protection of research participants' privacy and confidentiality

Research participant data is centrally stored in the District Health Information System. This digital system is password protected. To ensure confidentiality, this data is only accessible by the head researcher and supervisors.

Group discussion participant data is stored on password-protected computers in Masanga Hospital. Only the head researcher has access to the names, functions and health facilities of the participants. Reported data is anonymous and cannot be traced back to the specific health facility.

Independence of research and conflicts of interests

Research is conducted on behalf of Masanga Hospital and in collaboration with Tonkolili District. No other parties are involved. The researchers certify that they have no conflicts of interests.

Schedule

1-8 weeks:

- Contact with DMO and DHS, attending the district meetings and the district maternal mortality meetings in Magburaka
- Application for funding
- Application for District Health Information System access

8-20 weeks

- Analysis of DHIS data
- Group discussions

20-28 weeks

- Analysis and illustration of DHIS data
- Writing descriptive article

GANTT chart

	W1-4	W5-8	W9-12	W13-16	W17-20	W20-24	W24-28
DMO/DHS contact							
Initiation visits in PHUs/Hospitals							
DHIS access application							
Group discussions							
Data analysis							
Writing							
Submitting article							

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References

1. Sierra Leone Demographic and Health Survey 2013 via the DHS Program STATcompiler. (<http://www.statcompiler.com>).
2. Sierra Leone Reproductive, Maternal, Newborn, Child and Adolescent Health (RMNCAH) strategy 2017-2021, Ministry of Health Sierra Leone

For peer review only

Participant Informed Consent Form

Study title: Perceptions of health workers at peripheral health units in the catchment area of Masanga Hospital concerning the current referral system of obstetric patients

Researcher: Ryan Proos E-mail: ryanproos9@gmail.com

Institute: Masanga Medical Research Unit, Sierra Leone

	Add your initials if you agree
I agree that this interview will be recorded and that the data will be analyzed and reported anonymously.	
I understand that I can withdraw from this study at any time, without given reason and all my data will be deleted.	
I understand I can contact the Sierra Leone Ethics and Scientific Review Committee at any time (contact details below*).	

Name of participant:

Signature: Date:

Name of person taking consent:

Signature: Date:

* Contact details Sierra Leone Ethics and Scientific Review Committee:

E-mail: efoday@health.gov.sl

** this form needs to be signed and dated in presence of the patient. If preferred, the patient will receive a copy of this form. The forms will be stored in a secure location, ensuring patients privacy.