Appendix S1. List of international guidance, national guidelines and original articles used to identify treatment and monitoring items for inclusion in the modified Delphi process.

National and international guidelines as well as relevant articles within the literature were reviewed by FT and DL until saturation was achieved.

International guidance

- World Health Organization. Integrated Management of Pregnancy And Childbirth. Managing complications in pregnancy and childbirth: a guide for midwives and doctors. World Health Organization, Geneva, 2003
- World Health Organization. Education material for teachers of midwifery: midwifery education modules, 2nd edition. World Health Organization, Geneva, 2008
- World Health Organization. IMAI District Clinician Manual. Hospital Care for Adolescents and Adults: Guidelines for the management of common illnesses with limited resource, volume 2. World Health Organization, Geneva, 2011
- World Health Organization: WHO Model List of Essential Medicines, 16th edition. http://www.who.int/medicines/publications/essentialmedicines/Updated_sixteenth_adult_list_en.pdf (accessed May 2011).
- Medicines Sans Frontieres. Clinical guidelines - Diagnosis and treatment manual. 2013 Edition.
- Dellinger RP, Levy MM, Rhodes A, et al: Surviving Sepsis Campaign: International guidelines for management of severe sepsis and septic shock. Intensive Care Med 2013; 39(2):165-228 and Crit Care Med 2013; 41(2):580- 637.
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National Guidelines

- Ministry of Health and Social Welfare, The United Republic of Tanzania. Standard Treatment Guidelines and Essential Medicines List, 4th Edition, 2013
- Food, Medicine And Health Care Administration And Control Authority of Ethiopia. Standard Treatment Guidelines For General Hospitals 3rd Edition, 2014
- Ministry of Health, Ghana. Standard Treatment Guidelines, 6th Edition, 2010
- Ministry of Health, Malawi. Malawi Standard Treatment Guidelines, 5th Edition, 2015
- Ministry of Medical Services and Ministry of Public Helath & Sanitation, Republic of Kenya. Clinical Management and Referral Guidelines – Volume III: Clinical Guidelines for Management and Referral of Common Conditions at Levels 4-6: Hospitals, 2009

- Ministry of Health, Uganda. Uganda Clinical Guidelines 2012; National Guidelines for Management of Common Conditions, 2012
- The UK Sepsis Trust. Screening and Action Tool for Use in Pregnancy. Accessed from: https://sepsistrust.org/professional-resources/clinical/
- Maternal Health Division, Ministry of Health & Family Welfare, Government of India. Trainers' guide for training of Medical Officers in Pregnancy Care and Management of Common Obstetric Complications, 2009
- Health & Family Welfare Department, Government of Odisha. Standard Treatment Guideline & Essential Medicine List (For Pregnant Women), 2012
- The Medical Microbiology & Infectious Diseases Society of Pakistan: Guidelines for the Adult Patient for Initial Management of Sepsis/Severe Sepsis/Septic Shock: 2015
- Ministry of Health and Population, Government of Nepal. National Antibiotic Treatment Guidelines, 2014
- Family Health Division, Ministry of Health, Nepal. National Medical Standard for Reproductive Health Volume II, 2003
- Royal College of Obstetricians and Gynaecologists. Bacterial Sepsis in Pregnancy. Green-top Guideline No.64a, 2012
- Royal College of Obstetricians and Gynaecologists. Bacterial Sepsis in Pregnancy. Green-top Guideline No.64b, 2012

Original Articles

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Appendix S2. Questionnaire used in rounds one and two of the Delphi study.

1. Which country do you mainly work in? _____

2. What is your job title? _____

3. What setting do you work in? _____

4. In the last six months, have you managed a patient with maternal sepsis? _____

5. In your opinion, how **important** are the following items in the initial **treatment** of severe maternal sepsis (e.g. to be initiate within 3 hours) in low and low-middle income countries?

Please only think about the importance of each item. Feasibility will be asked about later in the survey.

Please rate the following:

	1 = very un-important	2	3	4	5 = very important
Administer intravenous fluid					
Obtain venous access					
Administer antibiotics early					
Give oxygen					
Consider assisted ventilation if required					
Ensure appropriate positioning of patient					
Identify and remove the underlying source of infection					
Give analgesia					
Give tetanus toxoid (if exposed to tetanus)					
Give antipyretics					
Consider a blood transfusion (if needed)					
Give low-dose steroids					
Ensure appropriate locate or care (e.g. referral to hospital or HDU)					

6. Do you think any items are currently **missing** from the previous set of questions? If so please comment below:

---

7. In your opinion, how **important** are the following items in **monitoring** patients already identified as having severe maternal sepsis (within first three hours), in low and low-middle income countries?

Please rate the following:

	1 = very un-important	2	3	4	5 = very important
Respiratory rate and heart rate (using a watch)					
Temperature (using thermometer)					

Blood pressure (Systolic/Diastolic using sphygmomanometer)					
Mean arterial pressure (using sphygmomanometer and calculator)					
Conscious level					
Urine output (by catheter)					
Capillary refill					
Oxygen saturations (by pulse oximetry)					
Blood glucose					
Blood culture (prior to commencing antibiotics)					
Culture of sample (e.g. lochia/urine/other swab)					
Microscopy/Gram staining (e.g. Pus or MSU)					
Haemoglobin					
Lactate level					
C-Reactive Protein					
White Cell Count					
Platelets					
Urea & Electrolytes					
Clotting					
PCV, haematocrit					
Sickling					
HIV rapid test					
Malaria testing					
Radiological investigations (Chest XR, Abdominal XR or pelvic USS)					
Monitoring and treatment of baby (if appropriate)					

8. Do you think any items are currently **missing** from the previous set of questions? If so please comment below:

---

9. How **feasible** do you think the use of the following will be in a **health centre** in a low and low-middle income country?

(By health centre we are considering a health facility which is aiming to provide basic emergency obstetric care. As such this is a facility where vaginal deliveries will usually take place, as well as routine antenatal and post-natal care but there is no recourse to caesarean section. There may be non- physician clinicians present as well as nurses and midwives; however it is unlikely there will be any doctors working at this sort of facility.)

Please rate the following:

	1 = definitely un-feasible	2 = un-feasible	3 = feasible	4 = definitely feasible
Administer intravenous fluid				
Obtain venous access				
Administer antibiotics early				
Give oxygen				

Consider assisted ventilation if required				
Ensure appropriate positioning of patient				
Identify and remove the underlying source of infection				
Give analgesia				
Give tetanus toxoid (if exposed to tetanus)				
Give antipyretics				
Consider a blood transfusion (if needed)				
Give low-dose steroids				
Ensure appropriate locate or care (e.g. referral to hospital or HDU)				
Respiratory rate and heart rate (using a watch)				
Temperature (using thermometer)				
Blood pressure (Systolic/Diastolic using sphygmomanometer)				
Mean arterial pressure (using sphygmomanometer and calculator)				
Conscious level				
Urine output (by catheter)				
Capillary refill				
Oxygen saturations (by pulse oximetry)				
Blood glucose				
Blood culture (prior to commencing antibiotics)				
Culture of sample (e.g. lochia/urine/other swab)				
Microscopy/Gram staining (e.g. Pus or MSU)				
Haemoglobin				
Lactate level				
C-Reactive Protein				
White Cell Count				
Platelets				
Urea & Electrolytes				
Clotting				
PCV, haematocrit				
Sickling				
HIV rapid test				
Malaria testing				
Radiological investigations (Chest XR, Abdominal XR or pelvic USS)				
Monitoring and treatment of baby (if appropriate)				

10. If you have any additional comments please provide them below:

_____

_____

11. How **feasible** do you think the use of the following will be in a **district hospital** (or any facility where comprehensive essential obstetric care is available) in a low and low-middle income country?

Please rate the following:

	1 = definitely un-feasible	2 = un-feasible	3 = feasible	4 = definitely feasible
Administer intravenous fluid				
Obtain venous access				
Administer antibiotics early				
Give oxygen				
Consider assisted ventilation if required				
Ensure appropriate positioning of patient				
Identify and remove the underlying source of infection				
Give analgesia				
Give tetanus toxoid (if exposed to tetanus)				
Give antipyretics				
Consider a blood transfusion (if needed)				
Give low-dose steroids				
Ensure appropriate locate or care (e.g. referral to hospital or HDU)				
Respiratory rate and heart rate (using a watch)				
Temperature (using thermometer)				
Blood pressure (Systolic/Diastolic using sphygmomanometer)				
Mean arterial pressure (using sphygmomanometer and calculator)				
Conscious level				
Urine output (by catheter)				
Capillary refill				
Oxygen saturations (by pulse oximetry)				
Blood glucose				
Blood culture (prior to commencing antibiotics)				
Culture of sample (e.g. lochia/urine/other swab)				
Microscopy/Gram staining (e.g. Pus or MSU)				
Haemoglobin				
Lactate level				
C-Reactive Protein				
White Cell Count				
Platelets				
Urea & Electrolytes				

Clotting				
PCV, haematocrit				
Sickling				
HIV rapid test				
Malaria testing				
Radiological investigations (Chest XR, Abdominal XR or pelvic USS)				
Monitoring and treatment of baby (if appropriate)				

12. If you have any additional comments, please provide them below:

Thank you very much for completing this survey.

This survey will form the first stage of the Delphi process that will help us design the bundle. We would like to contact you again with a refined set of questions to reach consensus on the right components of the bundle.

If you are happy to be contacted again please enter your email address below, we will only contact you up to two more times as part of this process.

_____

Appendix S3. Questionnaire used in round three of the Delphi study.

Following completion of the first and second rounds of the Delphi, we have arranged the top ranking elements in the below tables, applying a rank according to the mean score given for the importance for each element, as identified by both panels.

The steering committee have reviewed the responses for both practitioner and expert panels and found there was consensus on the five most important **treatment** elements.

The five most important **treatment** elements (and mean score) using results from both panels

Practitioner Panel	Rank	Expert Panel
Antibiotics Mean = 4.90, SD 0.58	**1**	**Antibiotics** Mean = 5.00, SD 0.00
IV Access* Mean = 4.83, SD 0.69	**2**	**IV Access*** Mean = 5.00, SD 0.00
IV Fluids Mean = 4.71, SD 0.76	**3**	**IV Fluids** Mean = 4.64, SD 0.48
Source Control Mean = 4.56, SD 0.82	**4**	**Location** Mean = 4.36, SD 0.34
Location Mean = 4.39, SD 0.97	**5**	**Source Control** Mean = 4.09, SD 1.16

*IV access will be removed from the final ranking as it is intrinsic to two other top ranked elements (administration of IV fluids and IV antibiotics).

The steering committee also found there was consensus on the following seven most important **monitoring** elements.

The seven most important **monitoring** elements (and mean score) using results from both panels

Practitioner Panel	Rank	Expert Panel
Blood Pressure Mean = 4.85, SD 0.58	**1**	**Respiratory Rate & Heart Rate** Mean = 4.82, SD 0.39
Respiratory Rate & Heart Rate Mean = 4.80, SD 0.70	**2**	**Conscious Level** Mean = 4.82, SD 0.39
Urine Output Mean = 4.73, SD 0.69	**3**	**Urine Output** Mean = 4.64, SD 0.48
Conscious Level Mean = 4.71, SD 0.71	**4**	**Monitoring of Baby** Mean = 4.64, SD 0.48
Temperature Mean = 4.65, SD 0.75	**5**	**Blood Pressure** Mean = 4.55, SD 0.66
Monitoring of Baby Mean = 4.46, SD 0.94	**6**	**Temperature** Mean = 4.27, SD 0.96
Oxygen Saturation** Mean = 4.38, SD 1.00	**7**	**Oxygen Saturation**** Mean = 4.27, SD 0.96

** Oxygen Saturation was ranked highly in terms of importance but many practitioners reported it was not currently feasible in their setting. Following discussions at the WHO meeting in February, it was suggested that due to its importance this should be included, and recommended for use in those facilities where it was

available.

In addition to the tables above, please find below some figures showing further results from the first two rounds.

Figures 1 & 2 are scatter plots showing the importance against feasibility scores to show the trend for the elements in both hospital and health centre settings from round 1.

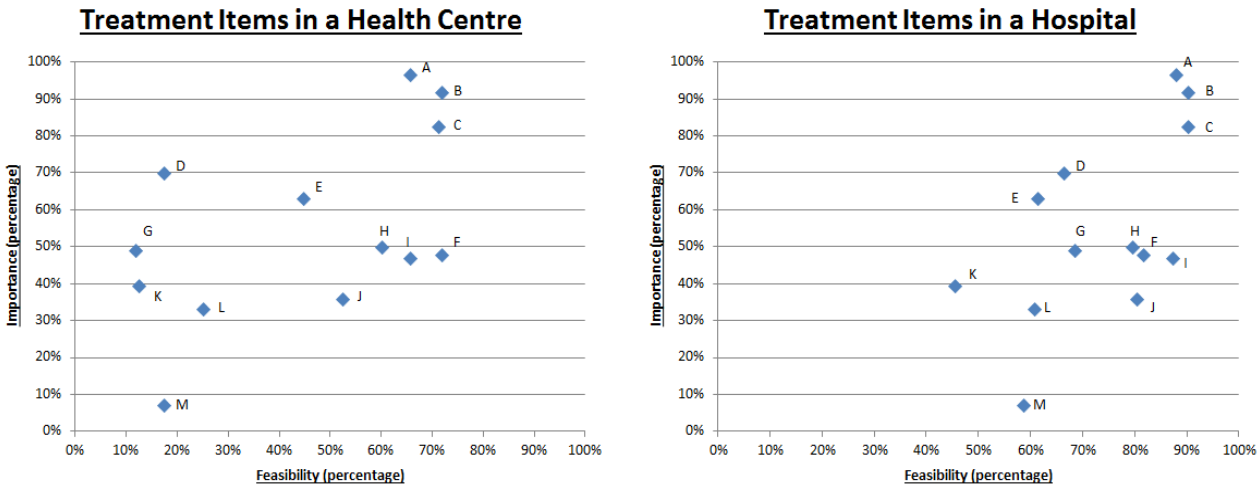

Figure 1: Scatter Plot showing the percentage of respondents who score an item as "definitely feasible" plotted against the percentage scoring the item as "very important" for treatment elements in both a health centre and hospital setting

A	Administer antibiotics early	**H**	Give tetanus toxoid (if exposed to tetanus)
B	Obtain venous access	**I**	Ensure appropriate positioning of the patient
C	Administer Intravenous Fluid	**J**	Give analgesia
D	Identify and remove the underlying source of infection	**K**	Consider assisted ventilation if required
E	Ensure appropriate location for care (e.g. referral to hospital or HDU)	**L**	Give Oxygen
F	Give antipyretics	**M**	Give low-dose steroids
G	Consider a blood transfusion (if needed)		

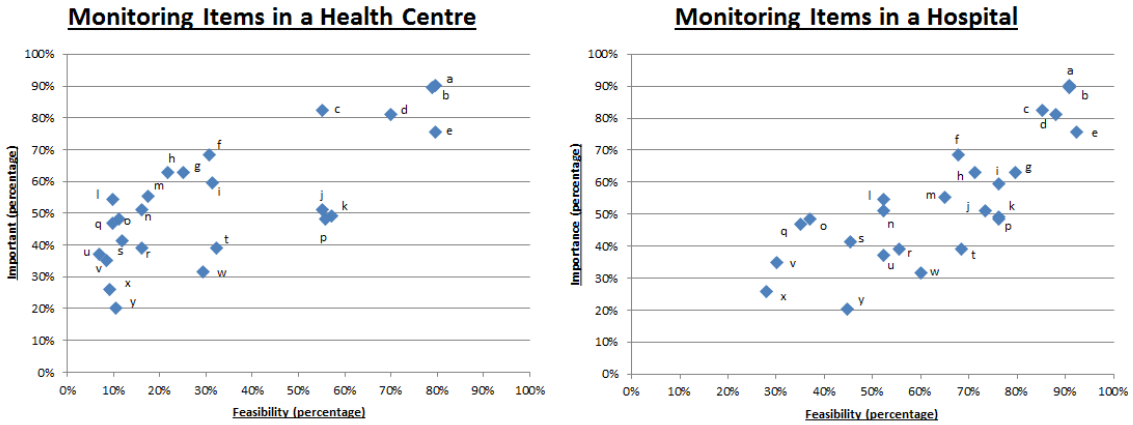

Figure 2: Scatter Plot showing the percentage of respondents who score an item as "definitely feasible" plotted against the percentage scoring the item as "very important" for monitoring elements in both a health centre and hospital setting

a	Blood Pressure (using sphygmomanometer)	**j**	HIV rapid test	**s**	Microscopy/Gram staining (e.g. Pus or MSU)
b	Respiratory Rate & Heart Rate (using watch)	**k**	Malaria testing	**t**	Blood Glucose
c	Urine Output (by catheter)	**l**	Urea & Electrolytes	**u**	Radiological Investigations (e.g. XR or USS)
d	Conscious Level	**m**	Platelets	**v**	Lactate Level
e	Temperature (using thermometer)	**n**	Clotting	**w**	Mean Arterial Pressure
f	Monitoring and treatment of baby if appropriate	**o**	Culture of sample (e.g. lochia/urine)	**x**	C-Reactive Protein
g	Oxygen Saturation (by pulse oximetry)	**p**	Capillary Refill	**y**	Sickling
h	White Cell Count	**q**	Blood Culture (prior to antibiotics)		
i	Haemoglobin	**r**	PCV, haematocrit		

Figures 3 & 4 are stacked bar charts showing the distribution of scores given in terms of importance of each item by our expert panel in round 2.

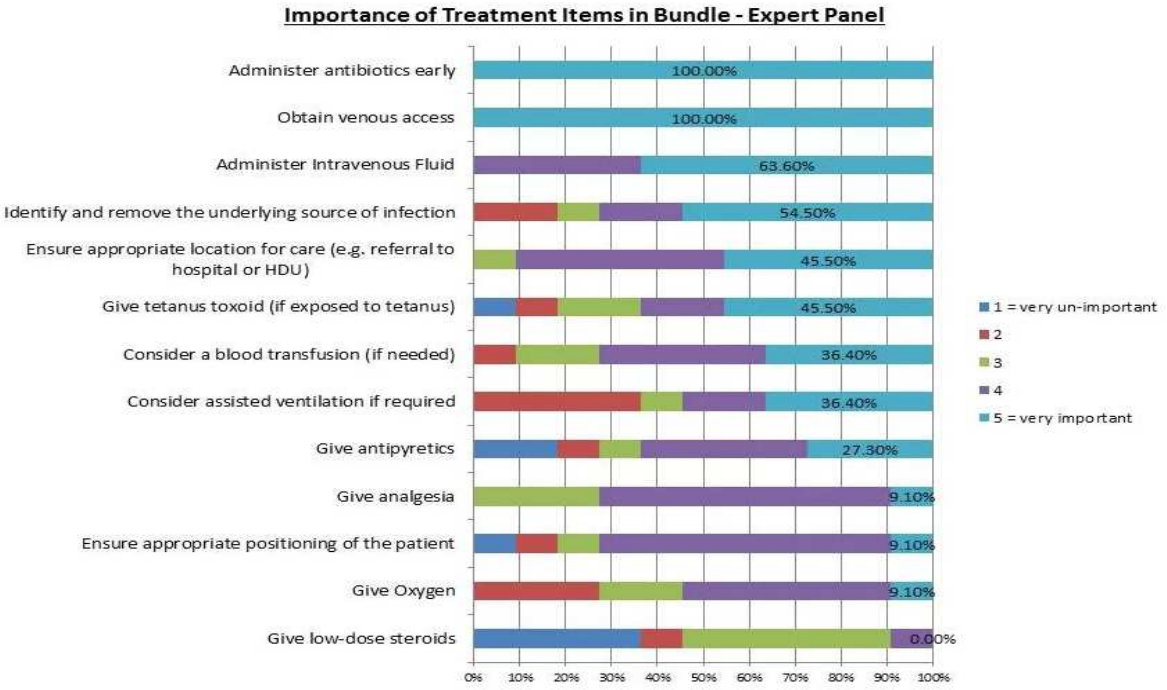

Figure 3: Results from the second round Delphi survey regarding the importance of treatment items using a Likert score out of 5. Data presented as 100% stacked bar chart with colours corresponding to the score given. The percentage highlighted indicates the proportion of respondents giving a score of 5/5 – "very important"

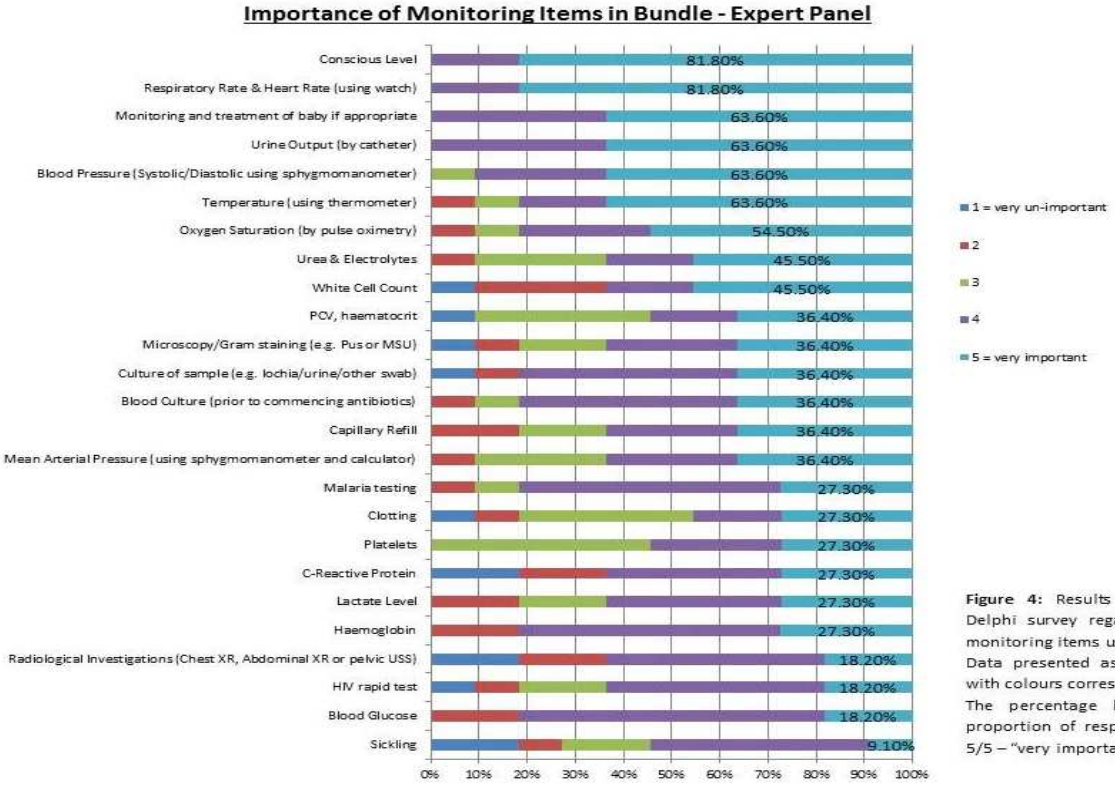

Figure 4: Results from the second round Delphi survey regarding the importance of monitoring items using a Likert score out of 5. Data presented as 100% stacked bar chart with colours corresponding to the score given. The percentage highlighted indicates the proportion of respondents giving a score of 5/5 – "very important"

Considering the above information, the key elements that were consistently found to be both feasible and important are as follows:

- Intravenous fluids
- Intravenous antibiotics
- Source (identification and control)
- Transfer (right facility and level of care)
- Monitoring of mother (blood pressure/ respiratory rate/ heart rate/ conscious level/ temperature/ urine output/ oxygen saturations (if available)) and neonate (if applicable)

1. Do you agree with that the above key elements should be included in the final bundle? Please provide comments if you wish.

Treatment elements YES / NO

Monitoring elements YES / NO

Comments:

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2. Are there any treatment or monitoring components you would like to **add** from the final bundle?

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3. Are there any treatment or monitoring components you would like to **remove** from the final bundle?

Thank you so much for completing this survey. These results will form the important final part of the Delphi process. We will be sure to contact you again soon to update you regarding the final results.