Recommendations for improving pneumonia and hypoxemia indicators

Every Breath Counts Indicators Sub-Group, August 2018

Background

Pneumonia is one of the leading causes of death in children globally, causing 6% of all neonatal deaths and 23% of deaths in children age 1-59 and leading to the deaths of nearly one million children under-5 every year.[1] Hypoxemia, low levels of oxygen in the blood, is a key feature in several disease that drive mortality in neonates, older infants, and children – including malaria, sepsis, pneumonia, and possible serious bacterial infection (PSBI). Accurate, reliable data on incidence, case management and treatment related to pneumonia and hypoxemia are essential to understand the problem, identify issues, and track progress.

At the moment, there are no reliable indicators and data sources on whether pneumonia and hypoxemia are being diagnosed and treated according to global and national guidelines. To address these concerns, key stakeholders convened to generate a list of recommended additions and changes to three main data sources: country Health Management Information Systems (HMIS) summary forms, the Service Provision Assessment (SPA) tool, and the Service Availability and Readiness Assessment (SARA) tool. This document details the draft recommendations agreed upon and solicit feedback for further refinement. Once all stakeholders have come to agreement, a formal submission of the recommendations will be submitted to relevant organizations and initiatives as appropriate. Note that the following recommendations are based on WHO guidelines as well as research from the global community and are intended to be applied to data collection exercises in all countries.

Health Management Information Systems (HMIS) summary forms

HMIS are designed for routine data collection to provide up-to-date information about service delivery for health program managers, community providers, and community members. The list of recommendations below reflects the WHO/IMNCI algorithms and terminology with the goal of harmonizing with IMNCI and iCCM registers; however individual countries will need to review and potentially refine this list to match country-specific clinical guidelines as well as adapt it for each level of the health system that will be reporting. Countries may also want to consider collecting data disaggregated by sex and urban/rural split. Country-specific OPD consultation registers, sick newborn forms, sick child forms, pediatric discharge summary forms, inpatient admission registers, and/or electronic hospital registers will need to be reviewed before implementing the recommended changes to determine whether the additional fields for the recommended changes to HMIS data elements below need to be added or updated for these tools as well. As with other HMIS indicators, the value of this information will be driven by the extent to which it is shared back with clinicians, with the goal of not only establishing bidirectional information exchange but also ensure that data is informs ongoing practices. Careful consideration is needed to ensure that the benefit of collecting these additional indicators ultimately outweighs the cost of the additional work required from healthcare workers.

[1] Liu, L., et al. (2016). "Global, regional, and national causes of under-5 mortality in 2000–15: an updated systematic analysis with implications for the Sustainable Development Goals." The Lancet **388**(10063): 3027-3035.

Recommendations for newborns and neonates, age 2-59 months		
	Recommended addition	**Rationale**
1	**Diagnosis/classification** Add fields: • Number of cases of children age 2-59 months with fast breathing and/or chest indrawing: pneumonia • Number of cases of children age 2-59 months presenting with an acute respiratory complaint and general danger signs*: severe pneumonia or very severe disease • Number of cases of children age 2-59 months with cough and cold: no pneumonia These fields can be totaled to represent number of children age 2-59 months presenting with an acute respiratory complaint i.e. history of cough or difficulty breathing lasting less than 14 days.	Some countries capture data on number of pneumonia or severe pneumonia cases; however the categories often do not match what is recommended in the current 3-tier classification per the 2014 WHO guidelines on pneumonia classification and treatment, as indicated here (pneumonia, severe pneumonia, cough and cold). Consistency in terminology for pneumonia diagnosis will allow for more direct comparison between sites in a country as well as between countries. These data elements will also serve as denominators for indicators related to pneumonia management and treatment. * General danger signs include not able to drink, persistent vomiting, convulsions, lethargic or unconscious, stridor in a calm child or severe malnutrition.
2	**Respiratory rate measurement** Add/update field for number of cases of children age 2-59 months presenting with an acute respiratory complaint with a respiratory rate taken	Respiratory rate is an essential vital sign, and IMNCI/WHO and algorithms suggest that all children with a respiratory complaint should be assessed for respiratory rate. Data on assessment of respiratory rate is also essential to understand whether providers are assessing children for the presence of fast breathing, a clinical sign of pneumonia. It is recommended that registers and/or patient records include a space for the respiratory rate (number of breaths per minute) to be recorded rather than a simple yes/no checkbox.
3	**Pulse oximetry measurement** Add/update field for number of cases of illness in children age 2-59 months with a pulse oximetry measurement taken	Pulse oximetry can quickly and easily identify children with hypoxemia, which requires urgent treatment with oxygen therapy, regardless of the underlying cause. According to WHO guidelines, "Pulse oximetry is the best method available for detecting and monitoring hypoxaemia… and is an accepted standard for detecting hypoxaemia…Use of pulse oximetry can also reduce unnecessary oxygen administration" Data on pulse oximetry use can be used to identify whether children are being properly assessed for hypoxemia at intake.

4	**Hypoxemia treatment** Add fields: • Number of cases of illness in children age 2-59 months with confirmed hypoxemia via pulse oximetry (e.g. SpO2<90%) • Number of confirmed hypoxemic cases in children under-5 given oxygen and treated at the facility • Number of confirmed hypoxemic cases in children under-5 not given oxygen but referred out • Number of confirmed hypoxemic cases in children under-5 given oxygen and referred out • Number of confirmed hypoxemic cases in children under-5 neither given oxygen nor referred out	Hypoxemia in children is "a strong risk factor for death," yet pediatric hypoxemia cases are not currently tracked as part of HMIS. This data, along with data on SpO2 readings recorded, can help identify the caseload of hypoxemic children as well as assess whether these children are receiving or are referred for the correct treatment (oxygen therapy).
5	**Non-severe pneumonia treatment** Add/update field for number of children age 2-59 months with fast breathing and/or chest indrawing pneumonia receiving antibiotics, with breakouts for: • Cases that received amoxicillin • Cases that did not receive amoxicillin but did receive any other type of antibiotic • Cases that did not receive an antibiotic	Some countries do not currently include pneumonia treatment data elements in HMIS summary forms. Amoxicillin is the WHO-recommended treatment for fast breathing and/or chest indrawing pneumonia in children. Collecting information on not only antibiotic treatment rates but also specifically on whether children are receiving the *correct* treatment can identify areas where supply chain or provider prescription practices may need to be improved. Countries may want to consider disaggregating further by amoxicillin formulation (dispersible tablet/oral suspension or tablets/capsules) to understand whether children are receiving a pediatric-friendly formulation or otherwise.
6	**Severe pneumonia treatment** Add/update field for number of children age 2-59 months with severe pneumonia receiving antibiotics, with breakouts for: • Cases that received the appropriate type of antibiotic(s) (as specified in country guidelines) • Cases that did not receive the appropriate type of antibiotic(s) but did receive any other type of antibiotic • Cases that did not receive an antibiotic	Some countries do not currently include pneumonia treatment data elements in HMIS summary forms. Collecting information on not only treatment rates but also specifically on whether children are receiving the *correct* treatment (based on local guidelines) can identify areas where supply chain or provider prescription practices may need to be improved.

Recommendations for newborns and neonates, age 0-59 days		
	Recommended addition	**Rationale**
1	**Neonatal diagnosis and classification** Add fields: • Number of cases of neonates age 0-59 days with fast breathing only • Number of cases of neonates age 0-59 days with clinical severe infection* • Number of cases of neonates age 0-59 days with possible severe bacterial infection These fields can be totaled to represent number of neonates presenting with an acute respiratory complaint i.e. history of cough or difficulty breathing lasting less than 14 days.	Consistency in terminology for diagnosis and classification of neonates will allow for more direct comparison between sites in a country as well as between countries. These data elements will also serve as denominators for treatment indicators. *Clinical severe infection is defined as at least one of the following signs: • Severe infection, i.e. movement only when stimulated • Not feeding well on observation • Temperature greater than or equal to 38 °C or less than 35.5 °C • Severe chest in-drawing.
2	**Respiratory rate measurement** Add/update field for number of cases of neonates age 0-59 days presenting with an acute respiratory complaint with a respiratory rate taken	Respiratory rate is an essential vital sign, and IMNCI/WHO and algorithms suggest that all children with a respiratory complaint should be assessed for respiratory rate. Data on assessment of respiratory rate is also essential to understand whether providers are assessing children for the presence of fast breathing, a clinical sign of pneumonia. It is recommended that registers and/or patient records include a space for the respiratory rate (number of breaths per minute) to be recorded rather than a simple yes/no checkbox.
3	**Pulse oximetry measurement** Add/update field for number of cases of illness in neonates age 0-59 days with a pulse oximetry measurement taken	Pulse oximetry can quickly and easily identify children with hypoxemia, which requires urgent treatment with oxygen therapy, regardless of the underlying cause. According to WHO guidelines, “Pulse oximetry is the best method available for detecting and monitoring hypoxaemia… and is an accepted standard for detecting hypoxaemia…Use of pulse oximetry can also reduce unnecessary oxygen administration” Data on pulse oximetry use can be used to identify whether children are being properly assessed for hypoxemia at intake.
4	**Hypoxemia treatment** Add fields: • Number of cases of illness in neonates age 0-59 days with confirmed hypoxemia via pulse oximetry (e.g. SpO2<90%) • Number of confirmed hypoxemic cases in neonates age 0-59 days given oxygen and treated at the facility • Number of confirmed hypoxemic cases in neonates age 0-59 days not given oxygen but referred out • Number of confirmed hypoxemic cases in neonates age 0-59 days given oxygen and referred out Number of confirmed hypoxemic cases in neonates age 0-59 days neither given oxygen nor referred out	Hypoxemia in children is “a strong risk factor for death,” yet pediatric hypoxemia cases are not currently tracked as part of HMIS. This data, along with data on SpO2 readings recorded, can help identify the caseload of hypoxemic children as well as assess whether these children are receiving or are referred for the correct treatment (oxygen therapy).

5	**Neonatal treatment** Add fields for: • Number of cases of neonates age 0-59 days with fast breathing only receiving the correct treatment according to local guidelines • Number of cases of neonates age 0-59 days with clinical severe infection receiving the correct treatment • Number of cases of neonates age 0-59 days with possible severe bacterial infection receiving the correct treatment	Collecting information on not only treatment rates but also specifically on whether children are receiving the *correct* treatment (based on local guidelines) can identify areas where supply chain or provider prescription practices may need to be improved.

Service Provision Assessment (SPA) & Service Availability and Readiness Assessment (SARA)

The SPA and SARA are data collection tools for periodic data collection activities (every 1-5 years) that aim to provide information on availability and readiness of facility-based health care. There is significant overlap between the two surveys; the recommendations below are intended for both surveys unless otherwise indicated. Countries will need to refine the list of areas to assess as well as the list of equipment to check for based on national clinical guidelines.

	Recommendation	Rationale
1	Expand/standardize areas where information on oxygen availability is collected to include following areas: 1. Pediatric area 2. Neonatal area 3. Maternity area 4. Surgery area 5. Non-communicable disease/chronic disease areas 6. General outpatient areas *See recommendation #2 for the specific oxygen equipment recommended to be assessed in each of these six areas*	Currently, availability of oxygen and related equipment is collected in the general outpatient area in both SPA & SARA, in NCD/chronic disease areas as specified in SPA, and surgery areas as specified in SARA. We recommend that oxygen systems and equipment also be assessed in areas where children and neonates are treated, as well as harmonize the list so that both the SPA and SARA collect data on oxygen from all 6 areas. It is essential to be able to track the availability and readiness of facilities to provide oxygen therapy specifically to children, as "hypoxemia is a life threatening condition… and occurs frequently in children with pneumonia, neonatal conditions, trauma, or perioperative emergencies...[but] can be treated easily by giving oxygen". Oxygen is included on the WHO Essential Medicines List for Children as a treatment for hypoxemia, and should have a dedicated source permanently dedicated to pediatric and neonatal areas.
2	In all 6 areas where information on oxygen is collected (see #1), assess availability of the following standardized list of equipment: • Functional oxygen concentrators • Functional oxygen cylinders • Functional central oxygen supply • Functional oxygen analyzer • Functional pulse oximeters • Pressure regulators • Cylinder gauges • Humidifiers • Low-flow meters (0-5L/min) • Pediatric nasal prongs* • Neonatal nasal prongs** • Nasal catheter or equivalent • Pediatric oxygen masks* • Neonatal oxygen masks** • Air-oxygen blenders** ** Pediatric & general OP only* *** Neonatal, maternity, & general OP only*	The current SPA and SARA surveys do assess availability (simple available/not available binary) of some of the pieces of equipment on this list, but not all. It is important to capture availability of not only oxygen itself but also the equipment necessary to adequately and safely deliver oxygen to the patient. Specialized equipment for treating children and neonates should be available in their respective areas. Availability may be assessed on a simple available/ not available binary system to minimize data collection time. Availability of a functional pulse oximeter is the first step to consistently and accurately identifying children with hypoxemia and is essential tool for monitoring SpO2 as oxygen is delivered so a provider knows when it is safe to take a patient off of oxygen support. Using these data elements, report analysis tables should also include the following indicators: • % of facilities with functional oxygen in areas where children under-5 are treated • % of facilities with functional pulse oximeters in areas where children under-5 are treated

3	Revise definition of “functional oxygen”: ● Concentrators and central oxygen (piped): oxygen analyzed (on the day of the survey) resulting in a concentration of 82% or higher ● Cylinders: certificate of analysis from filling plant available	Oxygen must be of a minimum concentration of 82% to be acceptable for medical application when tested at 40°C and 95% relative humidity. It is of utmost clinical relevance to ensure that oxygen being provided to any hypoxemic patients is of sufficient concentration in order to improve patient outcomes and save lives; therefore it is important that the definition of “functional” for oxygen sources includes an assessment of concentration of oxygen output. Assessment of oxygen concentration will require the purchase and use of portable oxygen analyzers. As it is not realistic or feasible to test the oxygen quality of all cylinders in a facility, availability of the certificate of analysis from the filling plant is considered an adequate substitute.
4	Add the following question to the SPA *Observation of Sick Child* questionnaire: Did the provider assess the child’s SpO2 using a pulse oximeter?	Pulse oximetry should be a part of routine assessment of all sick children. Pulse oximetry can quickly and easily identify children with hypoxemia, which requires urgent treatment with oxygen therapy, regardless of the underlying cause. Data on pulse oximetry use can be used to identify facilities lacking functional pulse oximeters or in need of provider refresher training.
5	In all areas where availability or prescription practices for amoxicillin is assessed, add a break out category specific to pediatric formulations: *Availability (or prescription) of amoxicillin oral suspension/syrup/DT*	Currently the SPA and SARA surveys capture data on amoxicillin in syrup and/or suspension formulation (in addition to tablets). Amoxicillin DT is the WHO-recommended formulation for children. Oral suspensions, syrups, and amoxicillin DT are considered the pediatric-friendly formulations and therefore should be captured as its own category.
6	Align wording between SPA and SARA surveys to consistently use the phrase “central piped oxygen supply”	SPA currently uses the phrasing “oxygen distribution system” which may be misleading; SARA does not specify that this is a *piped* oxygen system. Consistent terminology can help ensure that results from the two surveys are directly comparable.

Appendix A

Sample indicators

Below lists a sample of indicators that could be calculated if the above recommended changes are implemented, but is not intended to be exhaustive of all potential indicators.

HMIS

	Indicator	Numerator	Denominator
1	% of children age 2-59 months with acute respiratory illness diagnosed as: a) Pneumonia b) Severe pneumonia or very severe disease c) Cough and cold: no pneumonia	# of cases of children age 2-59 months classified as a) Chest indrawing or fast breathing pneumonia b) Severe pneumonia or very severe disease c) Cough and cold: no pneumonia	# of children age 2-59 months presenting with symptoms of acute respiratory illness*
2	% of acute respiratory illness who are assessed for respiratory rate: a) Children age 2-59 months b) Neonates age 0-59 months	# of cases presenting with an acute respiratory complaint with a respiratory rate taken a) Children age 2-59 months b) Neonates age 0-59 months	# of cases presenting with symptoms of acute respiratory illness* a) Children age 2-59 months b) Neonates age 0-59 months
3	% of cases with an SpO2 reading recorded a) Children age 2-59 months b) Neonates age 0-59 months	# of cases with a pulse oximetry measurement taken a) Children age 2-59 months b) Neonates age 0-59 months	# of cases presenting with symptoms of acute respiratory illness* a) Children age 2-59 months b) Neonates age 0-59 months
4	% of hypoxemic cases treated with oxygen a) Children age 2-59 months b) Neonates age 0-59 months	# of cases with confirmed hypoxemia treated with oxygen at the facility a) Children age 2-59 months b) Neonates age 0-59 months	# of cases with confirmed hypoxemia a) Children age 2-59 months b) Neonates age 0-59 months
5	% of hypoxemic children referred out a) Children age 2-59 months b) Neonates age 0-59 months	# of cases with confirmed hypoxemia referred for treatment a) Children age 2-59 months b) Neonates age 0-59 months	# of cases with confirmed hypoxemia a) Children age 2-59 months b) Neonates age 0-59 months
6	% of children with pneumonia treated with amoxicillin	# of cases of children age 2-59 months with fast breathing/chest indrawing pneumonia who received amoxicillin	# of cases of children 2-59 months with fast breathing/chest indrawing pneumonia
7	% of children with severe pneumonia/ very severe disease treated with the recommended antibiotics	# of cases of children age 2-59 months with severe pneumonia/very severe disease who received the recommended antibiotic treatment (based on country guidelines)	# of cases of children age 2-59 months with severe pneumonia/very severe disease
8	% of neonates receiving the correct treatment *To be revised once HMIS section for neonates is finalized*	# of cases of neonates age 0-59 days with PSBI receiving the correct treatment	# of cases of neonates age 0-59 days with PSBI

* Data element already captured as part of standard HMIS

SPA/SARA

	Indicator	Numerator	Denominator
1	% of facilities with functional oxygen available	# of facilities with a functional oxygen system (functional oxygen source and all required components)	# of facilities surveyed*
2	% of facilities with functional oxygen available in specific care areas: a) Pediatric area b) Neonatal area c) Maternity area d) Surgery area e) Non-communicable disease/ chronic disease areas f) General outpatient areas	# of facilities with a functional oxygen system (functional oxygen source and all required components) in the: a) Pediatric area b) Neonatal area c) Maternity area d) Surgery area e) Non-communicable disease/ chronic disease areas f) General outpatient areas	# of facilities surveyed with a: a) Pediatric area b) Neonatal area c) Maternity area d) Surgery area e) Non-communicable disease/ chronic disease areas f) General outpatient areas
3	% of facilities with functional oxygen available in areas where children under-5 are treated	# of facilities with a functional oxygen system (functional oxygen source and all required components) in pediatric and/or neonatal areas	# of facilities surveyed with a dedicated pediatric and/or neonatal area
43	% of facilities with functional pulse oximeters in areas where children under-5 are treated	# of facilities with a functional pulse oximeter in pediatric and/or neonatal areas	# of facilities surveyed with a dedicated pediatric and/or neonatal area
54	% of children under-5 who are assessed for SpO2	# of children under-5 who are assessed for hypoxemia with a pulse oximeter	# of children presenting with symptoms of respiratory illness*
65	% of facilities with pediatric-friendly amoxicillin formulation in stock	# of facilities with amoxicillin with oral suspension/syrup/DT in stock	# of facilities surveyed*

* Data element already captured in surveys

Appendix B

Sample HMIS summary form

The table below is from the current Nigeria HMIS summary form section on IMCI, to demonstrate how and what information on child pneumonia is currently captured in HMIS forms. This table is part of a larger summary form that has many other sections on facility identification as well as other disease areas and stock levels.

IMCI		Male	Female	Total
1	Diarrhoea new cases < 5 years			
2	Diarrhoea new cases < 5 years - given oral rehydration preparations (low osmolar ORS)			
3	Diarrhoea new cases < 5 years - given ORS and zinc supplementation			
4	Pneumonia new cases < 5 years			
5	Pneumonia new cases < 5 years - given antibiotics (amoxyl DT)			
6	Measles new cases < 5 years			