HUMAN CLINICAL RESOURCES FOR GLOBAL OUTBREAK RESPONSE:

Lessons Re-experienced Require a Paradigm Shift

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CLINICAL RESPONSE IN SIERRA LEONE IN FALL 2014

Assigned by WHO to Kenema Government Hosp in Sept 2014

Hybrid collaboration of KGH/Kenema/SL and WHO

Referral facility for most of SL (pts in Kenema and central/western SL)

No national/international clinical strategy provided

- Lack of ccope of care
- Limited dissemination of iterative clinical experience

Lesson #1

Clinicians are much less useful without a systematic clinical strategy

ARRIVAL AT KENEMA GOVERNMENT HOSPITAL

Only dedicated Lassa ward in the world

ETU referral center for western/central SL

~30 + HCW infections, nearly 20 died

No SL physicians working in ETU

Since Dr. X illness and evac, no clinical oversight in ETU

Re-establish goals/objectives care in ETU

FEW CLINICIANS, ? PT #s, WHAT TO PRIORITIZE

Photo of census removed to protect pt names

1. Get pts out of ETU who did not need to be there
2. Establish guidance for endemic disease therapies
3. Concentrate very sick pts in one ward to allow for aggressive resus
4. Limit any one person's resus so others get proper attention
5. Engage survivors and less ill in care for others

DATA/ANALYSIS ARE NOT RESEARCH,
They Are Essential To A Meaningful Response

Early essential questions, failure not an option:

1. How is disease transmitted in healthcare setting?
   - Epi surveys not sufficient- must have transmission assessment function embedded in early response
   - Are we using the right equip to prevent transmission (not just PPE, IV equip, blood draws, etc)?
   - Pearls- young children may become ill after their mother

2. Disease course and anticipated resources
   - Do we have the right arrangement of clinicians, support staff and equip
   - Early observations of predictors of mortality (need reliable info for triage)
   - Are there external factors impacting care (e.g. transporting pts 5-6 hrs in “ambulance” without hydration and in close contact with many people)

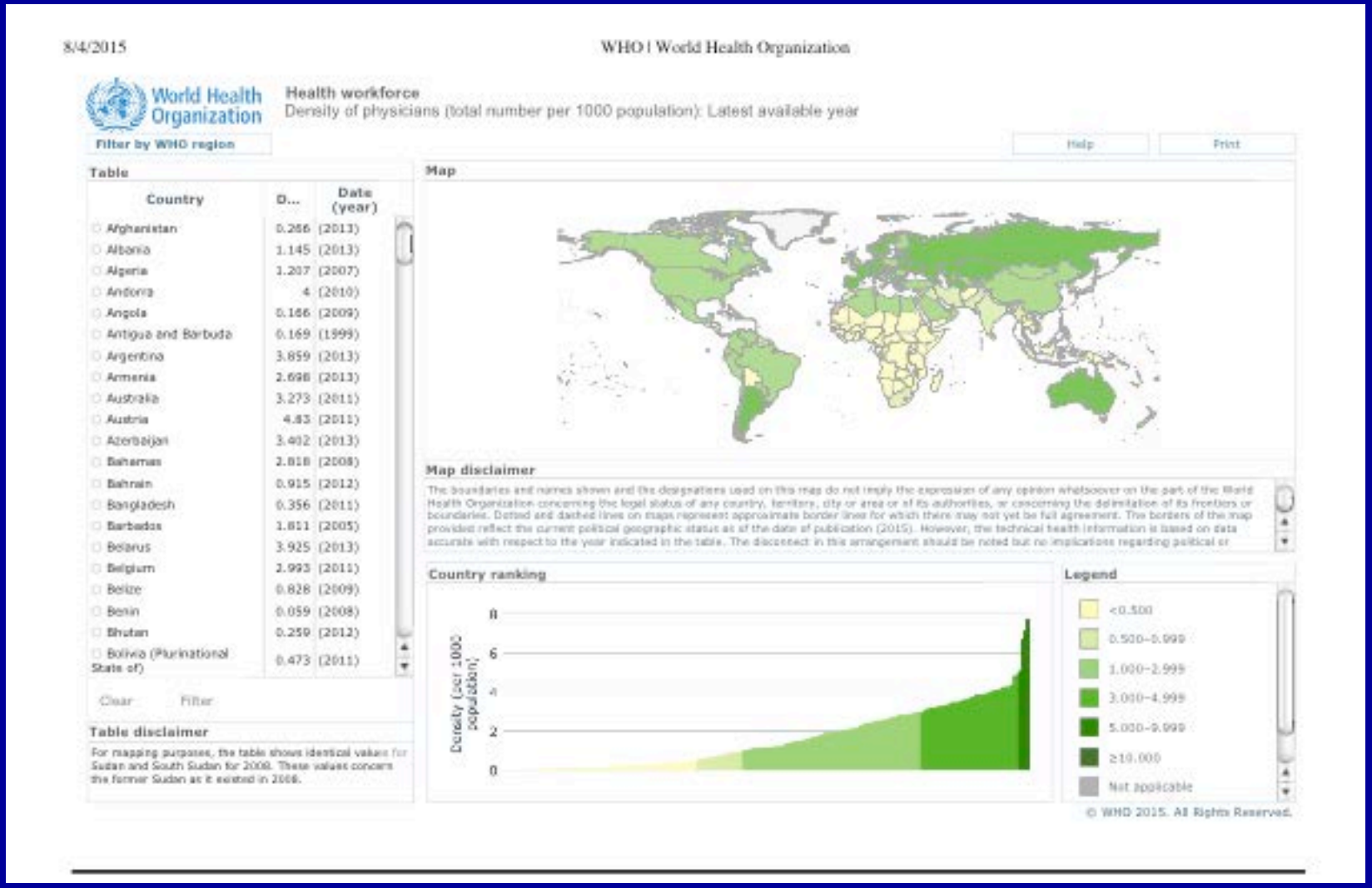
CLINICAL RESPONSE IS NOT JUST ABOUT BEDSIDE PROVIDERS

1. Disease transmission assessment must be initiated very early in response
2. Systematic clinical response strategy
   - Short-term, mid-term, longer-term functional objectives
     - Care must get iteratively better
   - Appropriate metrics to honestly assess status
     - E.g. critical mortality, preventable deaths, system stress
   - Should be done by seasoned clinicians
3. Patient data collection with meaningful information
   - Data collection must be able to occur in high risk settings
4. International cohort of out of country experts who can increase bandwidth to answer encountered clinical problems

Lesson #2

Responding clinicians must be practicing clinicians until the response is mature

HETEROGENEOUS DISTRIBUTION OF CLINICIANS WORLDWIDE



8/4/2015 WHO | World Health Organization

World Health Organization

Health workforce

Density of physicians (total number per 1000 population): Latest available year

Filter by WHO region

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Table

Country	D...	Date (year)
Afghanistan	0.286	(2013)
Albania	1.145	(2013)
Algeria	1.207	(2007)
Andorra	4	(2010)
Angola	0.166	(2009)
Antigua and Barbuda	0.169	(1999)
Argentina	3.859	(2013)
Armenia	2.698	(2013)
Australia	3.273	(2011)
Austria	4.83	(2011)
Azerbaijan	3.402	(2013)
Bahamas	2.818	(2008)
Bahrain	0.915	(2012)
Bangladesh	0.356	(2011)
Barbados	1.811	(2005)
Belarus	3.925	(2013)
Belgium	2.993	(2011)
Belize	0.828	(2009)
Benin	0.059	(2008)
Bhutan	0.259	(2012)
Bolivia (Plurinational State of)	0.473	(2011)

Clear Filter

Table disclaimer

For mapping purposes, the table shows identical values for Sudan and South Sudan for 2008. These values concern the former Sudan as it existed in 2008.

Map

Map disclaimer

The boundaries and names shown and the designations used on this map do not imply the expression of any opinion whatsoever on the part of the World Health Organization concerning the legal status of any country, territory, city or area or of its authorities, or concerning the delimitation of its frontiers or boundaries. Dotted and dashed lines on maps represent approximate border lines for which there may not yet be full agreement. The borders of the map provided reflect the current political geographic status as of the date of publication (2015). However, the technical health information is based on data accurate with respect to the year indicated in the table. The disconnect in this arrangement should be noted but no implications regarding political or

Country ranking

Density (per 1000 population)

8
6
4
2
0

Legend

- <0.500
- 0.500–0.999
- 1.000–2.999
- 3.000–4.999
- 5.000–9.999
- ≥10.000
- Not applicable

SOME DISEASE FEATURES ARE PREDICTABLE

Almost all deadly diseases cause severe sepsis/septic shock

- Particular organs involved and impact on disease course are the unknowns, but management of severe sepsis is anticipated

Supportive care likely to have major role until disease-specific therapeutics are available

Children are likely to be impacted

Co-infection with endemic diseases or clinical features may ovelap with those seen in endemic disease

WHAT WAS PROVEN ABOUT EVD CLINICAL CARE BEFORE 2014?

Prior clinical guidance based on limited data and care in very challenging environments

Oral vs parenteral fluid resuscitation was opinion-based

- Driven from cholera experience, but N/V and mental status issues may make different
- Amount of fluid is controversial

Addl supportive care regimens were opinion-derived and controversial when compared to modern critical care knowledgebase

- Nutrition (? Importance, timing, amount)

Tens of thousands of patients later, what do we know?

We continue to have more questions than answers

Most of how we manage EVD is how we manage general sepsis syndromes

Translating resource-rich strategies for high impact in resource-limited environments

Organ System	Syndrome	Clinical Exam	Diagnostics	Interventions
			(depends on availability)	
Neurological				
	Encephalopathy	A V P U Trousseau's sign Kernig's and Brudzinski's signs Tone (e.g. spasticity)	Temperature Malaria testing U/S eval of optic nerve Ionized calcium Serum sodium	• Clinician must determine if patient's agitation is too severe to safely provide any high-risk interventions If can be done safely: • Antipyretic if T> 38.5 • Sedative if agitated (avoid neuroleptics if NMS possible and pt febrile and rigid, if severe met acidosis caution with respiratory depressing meds such as benzodiazepines) • If ICP elevated (e.g. U/S eval of optic nerve), and pt sedated, consider Na goal 145-155 with 3% NaCl peripherally (avoid mannitol) • Except for children at risk of hypoglycemia, caution must be used when considering IV fluids with dextrose or glucose • Consider treatment for cerebral malaria when appropriate • If believed to be pre-morbid state (e.g. unresponsive and pt with abdominal paradox) consider analgesic, anxiolytic, anti-sialagogue for end-of-life comfort
	Clinically Apparent Seizures			• Drugs which cannot be rapidly administered due to hypotension

When overwhelmed who may be too ill to benefit from limited care resources

Variable	All Patients	Patients Who Died	Patients Who Recovered	Odds Ratio (95% CI)†
		no./total no. (%)		
Demographic characteristics				
Male sex	685/1415 (48.4)	515/1056 (48.8)	170/359 (47.4)	0.93 (0.73–1.19)
Age group				
<15 yr	190/1378 (13.8)	145/1021 (14.2)	45/357 (12.6)	1.18 (0.83–1.71)
15–44 yr	838/1378 (60.8)	577/1021 (56.5)	261/357 (73.1)	0.48 (0.36–0.62)
≥45 yr	350/1378 (25.4)	299/1021 (29.3)	51/357 (14.3)	2.47 (1.79–3.46)
Health care worker	158/1429 (11.1)	112/1067 (10.5)	46/362 (12.7)	0.86 (0.60–1.27)
Signs and symptoms				
General symptoms				
Fever‡	1002/1151 (87.1)	746/846 (88.2)	256/305 (83.9)	1.34 (0.92–1.95)
Fatigue	866/1133 (76.4)	633/829 (76.4)	233/304 (76.6)	0.94 (0.68–1.28)
Loss of appetite	681/1055 (64.5)	498/778 (64.0)	183/277 (66.1)	0.92 (0.69–1.23)
Vomiting	753/1114 (67.6)	566/816 (69.4)	187/298 (62.8)	1.19 (0.89–1.59)
Diarrhea	721/1099 (65.6)	555/813 (68.3)	166/286 (58.0)	1.42 (1.06–1.89)
Headache	553/1035 (53.4)	407/757 (53.8)	146/278 (52.5)	1.03 (0.78–1.36)
Abdominal pain	439/992 (44.3)	311/715 (43.5)	128/277 (46.2)	0.85 (0.64–1.13)
Muscle pain	385/990 (38.9)	293/728 (40.2)	92/262 (35.1)	1.24 (0.92–1.67)
Joint pain	374/950 (39.4)	283/695 (40.7)	91/255 (35.7)	1.32 (0.98–1.80)
Chest pain	254/686 (37.0)	196/488 (40.2)	58/198 (29.3)	1.53 (1.07–2.20)
Cough	194/655 (29.6)	150/462 (32.5)	44/193 (22.8)	1.74 (1.18–2.61)
Difficulty breathing	155/665 (23.3)	123/472 (26.1)	32/193 (16.6)	1.68 (1.10–2.63)
Difficulty swallowing	169/514 (32.9)	138/375 (36.8)	31/139 (22.3)	2.22 (1.41–3.59)
Conjunctivitis	137/658 (20.8)	109/465 (23.4)	28/193 (14.5)	2.03 (1.29–3.29)
Sore throat	102/467 (21.8)	82/339 (24.2)	20/128 (15.6)	1.94 (1.13–3.46)
Confusion	84/631 (13.3)	68/446 (15.2)	16/185 (8.6)	2.00 (1.14–3.71)
Hiccups	108/947 (11.4)	91/699 (13.0)	17/248 (6.9)	2.15 (1.27–3.82)
Jaundice	65/627 (10.4)	52/443 (11.7)	13/184 (7.1)	1.83 (0.99–3.63)
Eye pain	48/622 (7.7)	39/438 (8.9)	9/184 (4.9)	1.95 (0.95–4.40)
Rash	37/642 (5.8)	30/453 (6.6)	7/189 (3.7)	1.90 (0.86–4.83)
Coma or unconsciousness	37/627 (5.9)	34/445 (7.6)	3/182 (1.6)	4.59 (1.61–19.34)

N Engl J Med 2014 1481-1495.

OTHER PREDICTORS OF POOR OUTCOME

Variable	All Patients	Patients Who Died	Patients Who Recovered	Odds Ratio (95% CI)†
		no./total no. (%)		
Unexplained bleeding	168/932 (18.0)	140/693 (20.2)	28/239 (11.7)	1.83 (1.20–2.90)
Hematemesis	26/670 (3.9)	20/503 (4.0)	6/167 (3.6)	1.07 (0.44–3.01)
Blood in stool	48/843 (5.7)	35/614 (5.7)	13/229 (5.7)	0.98 (0.52–1.96)
Bleeding gums	19/837 (2.3)	18/608 (3.0)	1/229 (0.4)	6.69 (1.35–121.32)
Bloody nose	16/836 (1.9)	15/610 (2.5)	1/226 (0.4)	8.02 (1.54–148.62)
Bloody cough	20/831 (2.4)	16/605 (2.6)	4/226 (1.8)	1.63 (0.58–5.82)
Other bleeding	8/657 (1.2)	5/493 (1.0)	3/164 (1.8)	0.45 (0.11–2.23)
Bleeding at injection site	20/833 (2.4)	19/605 (3.1)	1/228 (0.4)	6.51 (1.32–118.04)
Blood from vagina§	14/431 (3.2)	13/290 (4.5)	1/126 (0.8)	6.0 (1.11–112.4)
Blood in urine	10/827 (1.2)	9/601 (1.5)	1/226 (0.4)	5.14 (0.90–98.73)
Bleeding under skin	5/827 (0.6)	5/604 (0.8)	0/223	NA

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WHO SHOULD DEPLOY?

Early in event

Seasoned clinicians comfortable with acute care

Specialists as needed (e.g. peds)

Work well in teams

Mental/ physical fitness

Clinical capabilities

Acute care

- For SARI, oxygen delivery and resp management

Peds/Ob

Infection Prevention

Endemic diseases

ACUTE CARE AND ENDEMIC DISEASE

Lesson #3

Clinicians should train/deploy in teams (with organic non-clinical capabilities) rather than be a labor pool

BENEFIT OF TEAMS

Coordinated command and control

Logistical independence

Security/ safety

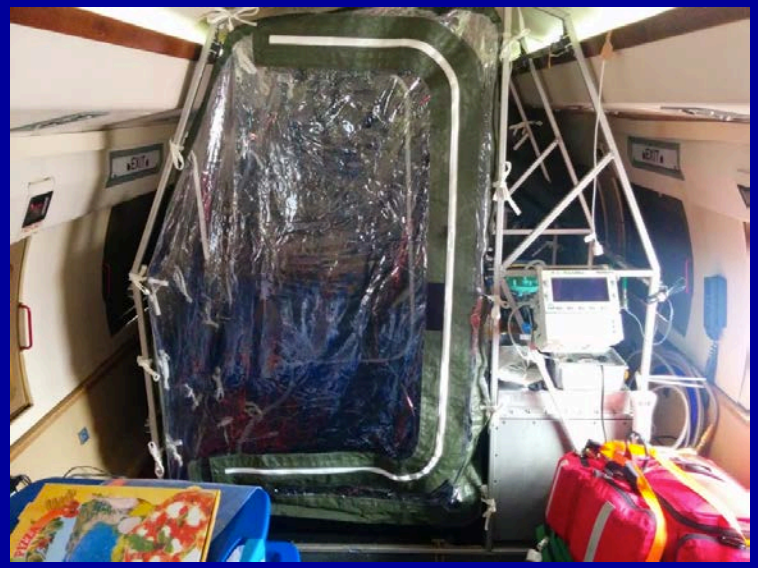
Occupational med issues

Standardized functional capabilities

Train together and familiarity before high stress environment

TEAMS MAKE SURE TEAM MEMBERS ARE CARED FOR

Individuals should not be left to figure out their own rescue



IF YOU BUILD IT RIGHT THEY WILL COME

1. Safety
   - Commitment to disease transmission assessment which drives procedures, equip, training
2. Dynamic assessment of status
   - Accurate assessments of functional status rather than just counting patients and deaths
   - Assessment is intended to dynamically improve care- don't send clinicians with expectation they will solve it in a vacuum
3. Many diseases are survivable with adequate supportive care
   - Give clinicians accurate picture of what they will be doing and any info on whether care may be helping
   - EVD was much more "benign" than I expected. Enhanced argument for utility of attempting supportive care

SURVIVORS

Photos removed for report to protect pt confidentiality