Experience with a computer-based clinical decision support tool to improve quality of maternal and newborn care in rural sub-Saharan Africa

Antje Blank

Department of Clinical Pharmacology and Pharmacoepidemiology
University Hospital Heidelberg
Germany
Clinical Decision Support Systems link health observations with health knowledge to influence health choices (decisions) by clinicians to improve health care

(working definition, Robert Hayward, Centre for Health Evidence)

paper decision tree charts → electronic systems („e“)
Sucessfull systems in western countries / numerous projects

Kuperman , J Am Med Inform Assoc, 14 (2007)
Kaplan, J Am Med Inform Assoc, 16 (2009)
Watson, Bmj, 341 (2010)
…and many others

Proven efficacy (among others..)
• Detection of situations of concern
• Reduction of errors
• Enhancement of patient safety (drug/ procedures)
• Improved treatments
Anticipated challenges in resource poor settings

- Infrastructure (electricity)
- Lack of computer skills among care providers
- IT infrastructures (rough condition for hardware: temperature, humidity, dust)
- Security
- IT support (question of timely user support)

Assumed infeasability of eCDSS implementation
– Primary strength: tailored decision support based on WHO guidelines for maternal care
  • Provision of knowledge at the point of care
  • Automated application of knowledge to guide/support decisions
  • Support adherence to guidelines

– Additional benefit / options
  • Motivation through technology
  • E-Learning
  • Facilitate administrative work
• Checklists: Guiding of routine actions (guidelines adherence)
  – Proposed actions
  – Checkboxes / data entry

• Electronic tracking of peri- and postnatal activities
  – Electronic partograph

• Detection of situations of concern
  – Algorithms with resulting warnings and proposed actions
History of current pregnancy - Part 1 of 3

Please greet the woman and make her feel welcome

Please ask the woman about her general well being

- No relevant complaints
- One or more of the following complaints:
  - Lost weight
  - Easily tired

  - Reported fever
    - Only within the last 48 hours
    - Within less than or exactly 1 month
    - More than 1 month ago

The woman has the following gastro-intestinal symptoms

- No relevant complaints
- Intermittent or continuous diarrhea

Please ask the woman if she had urinary / genital symptoms

- No relevant complaints
- One or more of the following complaints:
  - Burning on urination
  - Abnormal vaginal discharge

  - Itching at vulva

A Mama
24 years old
3rd pregnancy / 2 previous deliveries
25th week of current pregnancy

Known allergies
Amoxicillin
Chloroquine

First ANC
- History of current pregnancy
- Physical exam
- Laboratory
- HIV
- Other Information
- Consider the following advice
- Counseling and prevention
- Conclusion

Patient management
B Mama
23 years old
2nd pregnancy / 1 previous delivery
38th week of current pregnancy
2 known allergies
Physical exam - Part 1 of 5

Height: 158 cm
Weight: 50.0 kg

Blood pressure first reading: 150 / 120 mmHg
Blood pressure second reading: 150 / 100 mmHg

Heart rate: 80 bpm
Temperature: 38.8 °C

General appearance
- Normal
- Pathologic
  - Lethargic
  - Visible wasting
  - Very weak, unable to stand
  - Generalized edema (other than pretibial)

A Mama
- 24 years old
- 3rd pregnancy / 2 previous deliveries
- 25th week of current pregnancy

Known allergies
- Amoxicillin
- Chloroquine

First ANC
- History of current pregnancy
- Physical exam
- Laboratory
- HIV
- Other Information
- Consider the following advice
- Counseling and prevention
- Conclusion

![Warning: Blood pressure is still too high!]

[Okay]
### Consider the following advice - Part 1 of 5

#### The woman may suffer from severe pre-eclampsia

**Signs**
- Blood pressure first reading: 150/120 mmHg
- Proteinuria

**Advice**
- Give magnesium sulphate
- Give appropriate anti-hypertensives
- Revise the birth plan
- Refer urgently to hospital

#### The woman may suffer from severe anemia

**Signs**
- Measured hemoglobin value: less than 7 g/dl

**Advice**
- Refer urgently to hospital if possible
- Revise birth plan so as to deliver in a facility with blood transfusion services
- Give double dose of iron (1 tablet twice daily) for three months
- Counsel on compliance with treatment
- Give appropriate oral antimalarial
- Plan to follow up in 2 weeks to check clinical progress

---

**Known allergies**
- Amoxicillin
- Chloroquine

**First ANC**
- History of current pregnancy
- Physical exam
- Laboratory
- HIV
- Other Information
- **Consider the following advice**
- Counseling and prevention
- Conclusion

---

**A Mama**
- 24 years old
- 3rd pregnancy / 2 previous deliveries
- 25th week of current pregnancy
Did it work??
- All 18 sites were active (BF/GH/TZ)
- Enthusiasm and ongoing joy of use reported by research partners
- Active system May 2012 – April 2014

<table>
<thead>
<tr>
<th></th>
<th>Ghana</th>
<th>Burkina Faso</th>
<th>Tanzania</th>
</tr>
</thead>
<tbody>
<tr>
<td>Health workers trained</td>
<td>28</td>
<td>35</td>
<td>51</td>
</tr>
<tr>
<td>Pregnant women</td>
<td>5483</td>
<td>2981</td>
<td>2555</td>
</tr>
<tr>
<td>Visits</td>
<td>21797</td>
<td>6522</td>
<td>6203</td>
</tr>
<tr>
<td>Visits/woman</td>
<td>4.0</td>
<td>2.2</td>
<td>2.4</td>
</tr>
</tbody>
</table>
Adoption of the QUALMAT eCDSS (GH/TZ)

Tanzania

Ghana

Registered ANC clients
ANC clients in the eCDSS
Registered deliveries
Deliveries in the eCDSS

Number of clients

Months into the eCDSS use

Number of clients

Months into the eCDSS use
User satisfaction with the eCDSS after 18 months, N=56

Percentage

- I am satisfied with the trainings: 79%
- I like using computer in healthcare: 95%
- The CDSS is easy to use: 95%
- Using the CDSS helps in decision making: 89%
- The CDSS do not disrupts my work: 98%
- Using the CDSS do not takes more time: 48%
- I like the CDSS user interface: 84%
- Generally, I am satisfied with the CDSS: 93%
- My fellow workers are satisfied with the CDSS: 75%

% of Agreement

GH and TZ

Sukums et al., personal communication.
% of perceived challenges impending the eCDSS use

Challenges encountered (by country and phase)

- Electricity or solar problems
- Inadequate computer skills
- Inadequate ICT support
- Computer problems

TZ (10 months) 71, 53, 21, 14
TZ (18 months) 67, 44, 21, 13
GH (10 months) 44, 28, 11, 12
GH (18 months) 50, 18, 12

Sukums et al., personal communication.
Adoption of the eCDSS

- Providers
  - had positive attitudes towards the technology
  - accepted and constantly used the system
  - perceived it to be useful and easy to use
  - were satisfied with the eCDSS

- Facilitators and barriers identified
  - computer skills
  - training & supervision
  - provider motivation, workload
  - system maintenance
  - IT infrastructure
• time spent to provide antenatal care at baseline 6.5 min (median, IQR=4.0-10.6)

• **No** increase in time spent for antenatal care as compared to non intervention sites
  – significant time increase at both arms compared to baseline

• Some streamlined workflow (in Ghana only)
  – More medical history assessments prior to physical exams (Ghana only)
Before eCDSS
After eCDSS

H  History
E  Examination

Ghana

Frequency [%]

Tanzania

Frequency [%]
• The QUALMAT eCDSS was successfully implemented in rural resource poor settings
• eCDSS was well adopted and perceived useful
• Challenges identified but manageable
  – Effective communication between developer and user
  – Local implementation: observe facilitators and barriers
• Results on Quality of care: Neutral
Conclusion II / AND NOW??

- Accept limitation of QUALMAT study
  - Sample size: 6 center per country: pilot setting!
  - Local ownership?
  - As always: budget / duration of intervention

- Accept proof of principle
  - Scale up / onwards development desirable
  - Define target for support (bleeding/medical emergencies? counselling? training? Interpersonal skills?)
  - Align with WHO-/ national initiatives for e-health
  - Prepare for large studies to study outcome (morbidity / mortality)
Acknowledgments:
Felix Sukums (TZ) and Nathan Mensah (GH) and the members of the QUALMAT consortium

Congratulation to ICRH for 20 years of Sexual and Reproductive Health and Rights research, training and advocacy!