



@Joshua_Bress

What-you-see-is-what-you-get computer-interpretable guidelines: The case of NoviGuide Neonatal

Joshua Bress

President,
Global Strategies





Conflicts of interest

I have no conflicts of interest to disclose. I will be showing you a clinical decision support platform called NoviGuide. NoviGuide was developed by a non-profit organization registered in California. I help design the software, but do not personally derive any financial benefit from its use.

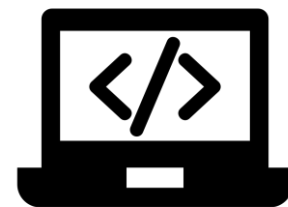


Objectives

- Describe our work converting a large volume of clinical guidelines into interactive assessments
- Review the most common way this conversion is done and why we found it did not match our needs
- Present an alternative approach



Clinical
Experts



CDS Software



Source
documents



Users

Welcome, Neonatal Ward!

NEW BABY



Born in last
24 hours



New baby,
>24 hours old

FOLLOW UP



Spot check



Rounding

EQUIPMENT PROFILE

Working ▼ Bilirubin testing

Working ▼ CPAP

Working ▼ Glucometer

Don't have ▼ High-flow nasal cannula

Don't have ▼ Mechanical ventilation

Working ▼ Neonatal bag/mask

Working ▼ Pulse oximeter

Working ▼ Oxygen concentrator

Working ▼ Phototherapy

EMERGENCY



Abdominal
Emergency



Seizure
Emergency

DISCHARGE



Discharge

OTHER



Drips to
Drops



Downes
Assessment

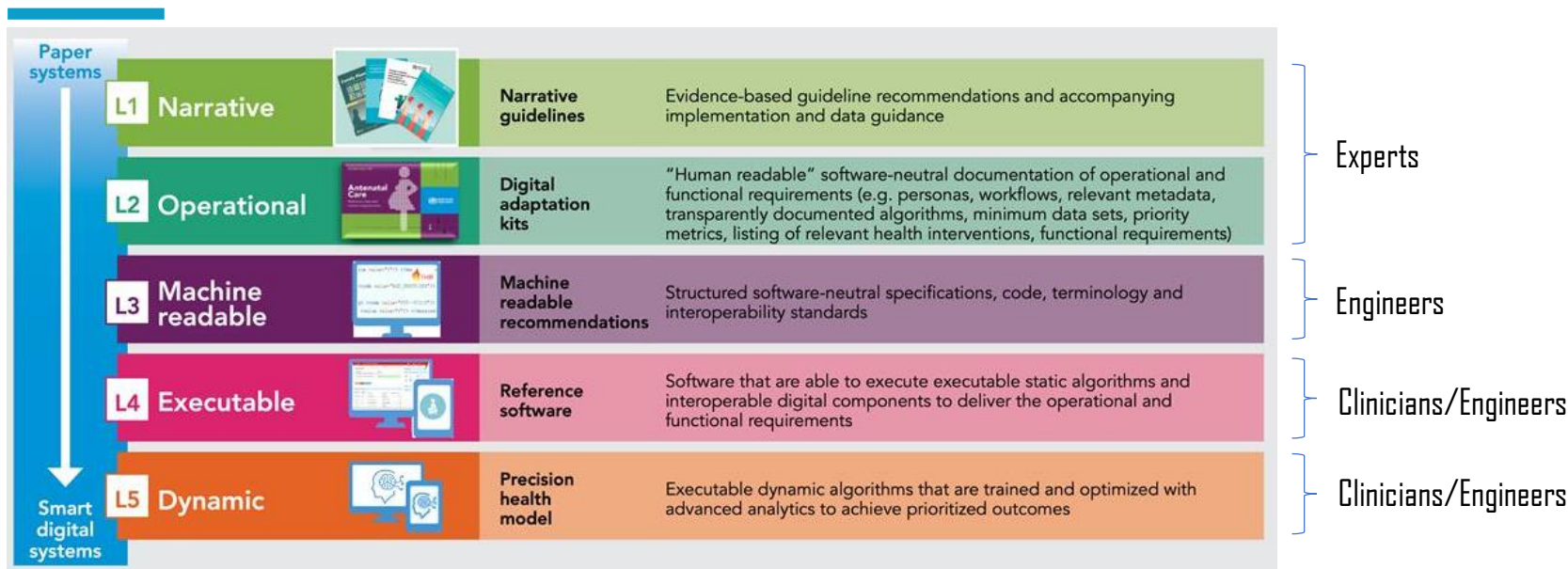
ASPHYXIA



Acute
Perinatal



The most common approach: Stepwise conversion





Three problems with stepwise conversion

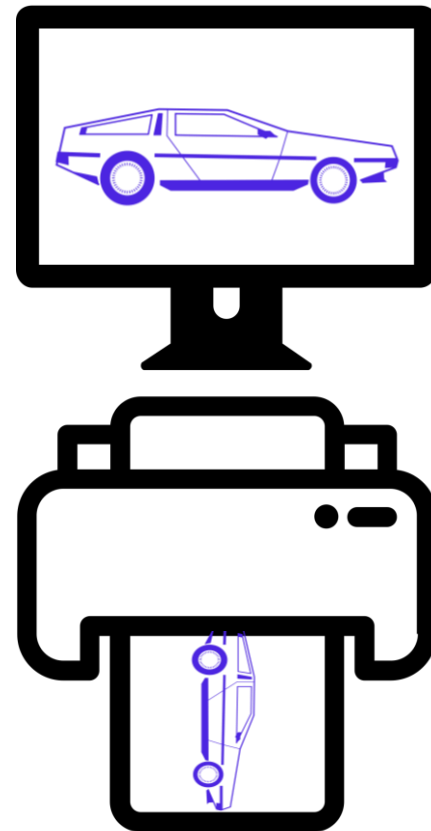
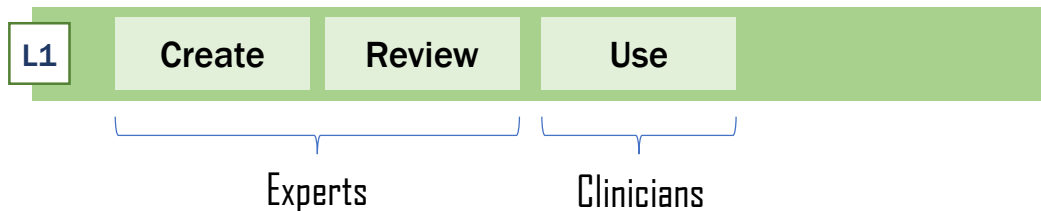
1. Errors, errors, errors
2. Slow
3. Missed opportunity a new
medium





Safety first: 1-layer approach

- A single format for creators and consumers





Logic-as-data makes this possible

```
{
  "id": "3813.o2-rounding-90-to-94-nodistress",
  "logicRank": 6,
  "pickCriteria": [
    {
      "sufficientToPick": [
        {
          "dataKey": "respiratory-distress",
          "referenceValue": "respiratory-distress.NONE"
        },
        { "referenceValue": "blood-oxygen.90-TO-94-PERC" }
      ]
    }
  ],
  "payload": {
    "resource": "card",
    "indicator": "warning",
    "summary": "You have indicated an O2Sat between 90 and 94 in a baby w",
    "summary-es-419": "Ha colocado una saturación de oxígeno entre 90 y 9",
    "summary-fr": "Vous avez indiqué une saturation en O2 entre 90 et 94"
  }
},
```

1

What is the baby's oxygen saturation level?



Choose ▼

3813.o2-rounding-90-to-94-nodistress

IF respiratory-distress = NONE & blood-oxygen = 90-TO-94-PERC

You have indicated an O2Sat between 90 and 94 in a baby who you believe is not in respiratory distress. This is possible in a preterm baby or a term baby that is transitioning, but should be confirmed with a physician.

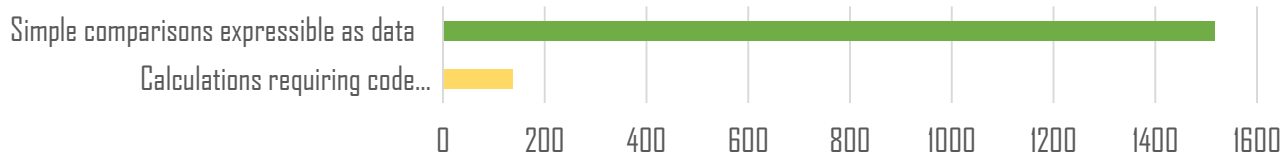


Adequacy of visualizations

- Large application → testing solely through output testing not feasible.
- Reviewing the logic in alignment mode the preferred method.

Adequacy of knowledge model

- 628 payloads are triggered using 1,654 total expressions encoded as data.
- 138 (8.3%) required helper functions.





Discussion

- The link between medical errors and CDS software errors
- We need to be creating in the digital space and not simply converting narrative guidelines





References

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2. Mehl G, Tungalp Ö, Ratanaprayul N, Tamrat T, Barreix M, Lowrance D, Bartolomeos K, Say L, Kostanjsek N, Jakob R, Grove J, Mariano B Jr, Swaminathan S. WHO SMART guidelines: optimising country-level use of guideline recommendations in the digital age. Lancet Digit Health. 2021 Apr;3(4):e213-e216. doi: 10.1016/S2589-7500(21)00038-8. Epub 2021 Feb 17. PMID: 33610488.
3. Muliokela R, Uwayezu G, Tran Ngoc C, et al. Integration of new digital antenatal care tools using the WHO SMART guideline approach: Experiences from Rwanda and Zambia. DIGITAL HEALTH. 2022;8. doi:10.1177/20552076221076256

Contact:

Joshua Bress, MD

Josh.bress@globalstrategies.org