

LEARNING HEALTH SCIENCES

Performance Summary Display Ontology (PSDO)

Feedback intervention content, delivery, and interpreted information

Zach Landis-Lewis, Cooper Stansbury, John Rincón, Colin Gross ICBO 2022

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I have no competing interests to declare

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Takeaways

- PSDO is a lightweight application ontology we developed to improve the study of clinical performance feedback
- We used BFO classes of role, quality, and information content entity to define elements of performance summaries
- PSDO may enable standardization of feedback intervention metadata in feedback systems for health care

Meet Dr. Jane

- Attending anesthesiologist at Michigan Medicine
- Gets a feedback email every month from the Multicenter
 Perioperative Outcomes Group (MPOG)
 - Quality of care
 - Care outcomes



Hello Dr. Jane,

Below is your MPOG quality performance report. For a case-by-case breakdown of any measures' result, click on the link at left to visit your quality dashboard.

Your Performance vs All Other Attendings







For each measure, Dr. Jane is compared to:

- organizational goal (dotted line)
- peer average (gray bar).

	4/1/2019 to 4/30/201
NMB-01: Train of Four	0% (9 / 9)
Taken	All Other Attendings, 9 2389
NMB-02: Reversal	You, 100% (9 / 9)
Administered	All Other Attendings, 99% (2367 / 2390)
PUL-01: Tidal Volume	You, 100% (9 / 9)



Automated feedback, delivered to 6,000+ providers Hello Dr. Jar in a national network Below is you case-by-cas link at left to visit your quality dashboard. Your Performance vs All Other Attendings 4/1/2019 to 4/30/2019 You, 100% (9/9 NMB-01: Train of Four Taken All Other Attendings, 96% (2303 / 2389) You, 100% (9 / 9 NMB-02: Reversal All Other Attendings, 99% (2367 / 2390) Administered You, 100% (9/9 PUL-01: Tidal Volume



Feedback is foundational in health systems

- Feedback loop: A process that delivers evaluative or corrective information to a living system
- More than a century of theory development on feedback in organizations
- Hundreds of trials of feedback
 about clinical practice



A research community guided by evidence and theory

Research community: Audit and Feedback MetaLab

- Clinical Performance Feedback Intervention Theory (CP-FIT)
 - Reflects our best understanding of how feedback works
 - Can improve our communication, learning, and future research

However, feedback research has hit a wall

- As a research community, we have not learned much about improving feedback in recent decades.
- Hundreds of trials show a pattern of mixed effects:
 - Potential for large effects
 - Small to moderate effects are common
- Growing interest in studying how and when different kinds of feedback are effective



Areas of imprecise thinking

- We lack a well-defined model of our "active ingredients", aka the **content** and **delivery** of feedback interventions
- Charts and graphs plays an important role in the success of feedback interventions
 - Differences in cognitive burden, graph literacy and numeracy

How an ontology may advance our thinking

What we might do as a research community:

- Adopt ontologically consistent definitions
- Specify feedback interventions with greater granularity to enable better evidence synthesis
- Better differentiate the content and delivery of feedback interventions to better compare different kinds

Confusion around content vs delivery

- Example: Are charts and graphs part of the content or delivery of a feedback intervention?
- Terms for kinds of content are used with alternate meanings
 - Goal: A metric vs a comparator
 - *Trend*: Change in performance vs comparison over time
 - *Velocity*: Amount of change vs frequency of feedback

Current state of email feedback

General problems for clinicians:

- Information chaos (Beasley et al 2011)
- Significant time pressure



Current state of email feedback

Dr Jane's question: Is it worth my time to follow-up about this?

Performance information is

- Frequently not actionable
- Not motivating
- Not surprising



Assumptions

People are different

Context matters

Things change

Source: https://www.pchalliance.org/news/how-do-you-change-behavior

Our team's research focus:

Precision feedback Hello Alex,

You reached the top performer benchmark this month for the measure <u>PUL-01</u>: <u>Protective Tidal volume, 10mL/Kg PBW.</u>



Objective

To develop an ontology of a **performance summary** in a clinical performance feedback intervention, for the purposes of standardizing research metadata.

Methods

- Adopted BFO as an upper ontology because of semantic interoperability with related ontologies in health
- Iteration over three activities:
 - a. Identifying terms from theoretical constructs
 - b. Searching for relevant ontologies and classes
 - c. Specifying existing performance summaries

Methods, continued

- Our work was conducted by a small team of faculty and students
- We developed the ontology via iterative specification of performance summaries from many clinical domains
- Our modeling decisions choices were guided by our use case of precision feedback, without community involvement

Results

- PSDO is a lightweight application ontology, focused on the content and delivery of performance information
- We developed the classes of the ontology primarily within 3 BFO classes:
 - a. information content entity
 - b. quality
 - c. role



Precision feedback use-case

- We are preparing for a cluster-randomized trial of precision feedback with ~3500 providers in an anesthesia quality improvement network (MPOG)
- PSDO is the ontological foundation for a knowledge-based system that generates precision feedback email

	Nov 21	Dec 21	Jan 22	Feb 22	Mar 22	Apr 22
Provider	97%	95%	94%	88%	86%	80%
Peer benchmark	93%	95%	88%	91%	92%	94%

Quality metric: Avoiding post-operative nausea and vomiting						
	Nov 21	Dec 21	Jan 22	Feb 22	Mar 22	Apr 22
Provider	97%	95%	94%	88%	86%	80%
Peer benchmark	93%	95%	88%	91%	92%	94%

Input 2: Email message template



1	Nov 21	Dec 21	Jan 22	Feb 22	Mar 22	Apr 22
Provider	97%	95%	94%	88%	86%	80%
Peer benchmark	93%	95%	88%	91%	92%	94%

Input 2: Email message template

Your performance has dropped to 80% for the quality measure <u>Avoiding Post- Operative Nausea</u> and Vomiting, remaining below the peer benchmark for 3 months.

> Nov Dec Jan Feb Mar Apr '21 '21 '22 '22 '22 '22

> > Peer Benchmark

0%

You

Input 3: PSDO classes (exerpt)

Loss content

Social comparator content

















Discussion

- We developed PSDO to better understand feedback, and to enable our research on precision feedback
- PSDO may improve the evaluation of feedback through:
 - a. Specification of new types of data in large-scale, automated feedback systems
 - b. Better standardization of data in systematic reviews and meta-analyses

Limitations

- We have not yet formally evaluated the ontology, but plan to evaluate its fitness for research purposes with domain experts
- The ontology is under-specified, however this may provide an avenue for community engagement

Conclusion

- PSDO is an ontology about performance summary information for the study of feedback interventions
- PSDO has potential to improve the standardization of research data collected in feedback systems

Thank you!

1) Percent of Patients ≥65 Years Old Filling a Prescription for Beta-blockers Within 30 Days Post-discharge

Target rate:	85%
Your hospital:	50%
Average for Quebec teaching hospitals (SD):	67% (5)
Quebec average (SD):	57% (4)





Opportunity and risk of large scale systems

- Feedback systems create both opportunity and risk
 - Learning and improvement at large scale
 - Wasted time, attention, and energy of providers
- Common tools:
 - Email and clinical quality dashboards
 - Decision support systems
 - Patient-reported outcomes
- Usability gains importance with increasing system scale