Bench to Bedside:
Detailing the Catalytic Roles of
Fully Integrated Information Scientists

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Center for Knowledge Management
Strategy & Innovation
Vanderbilt University Medical Center

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Center for Knowledge Management (CKM)

Fueled by VUMC’s transformative programs, discoveries, and learning health systems, CKM proactively engages in the collection, translation, and curation of external and internal knowledge and data, to best inform and document the decision processes of the organization.

Managing Knowledge

- Consumer Health Informatics
- Social and Behavioral Determinants of Health
- Genetics and Precision Medicine
- Decision Support
- Technology, Information-Seeking, and Data Integration
- Evidence, Critical Appraisal, and Information Filtering

https://www.mc.vanderbilt.edu/ckm/
Strategic mapping of skills to priorities of the learning health system

“A learning health care system continuously and reliably captures, curates, and delivers the best available evidence to guide, support, tailor, and improve clinical decision making and care safety and quality” (Institute of Medicine 2013).


Skills/knowledge required for successful evidence collaborations:

- Monitoring for new knowledge
- Biomedical content knowledge
- Familiarity with biomedical literature (incl. grey lit.)
- Expert searching
- Evaluation of bias/conflict of interest
- Information synthesis
- Study appraisal & filtering

Deliberately honed through intensive formal & experiential training
CKM’s History of Evidence Provision

• For more than 20 years, CKM information scientists have provided expertly-filtered & synthesized evidence

• Evolution of CKM evidence services:
  • Clinical Informatics Consult Service (1996)
  • Evidence-Based Medicine Literature Request Information Basket (2004)
  • Evidence support for institutional ordersets (2005)

• This work impacts research, patient care, clinical practice, & healthcare management

Image credit: http://www.thebluediamondgallery.com/wooden-tile/e/evidence.html

CKM Projects

scalable projects impacting clinical decision-making at the population or institutional level (or beyond)

complex, patient-specific questions that require precise searching and extraction of information relevant to an individual’s unique clinical condition and comorbidities
Clinical Support Knowledge Acquisition & Archival Tool

- A central repository for local *clinical decision support* in which evolving institutional care policies/clinical systems artifacts and *substantiating evidence* are committed to the *institutional memory*

- Provides the functionality for *linking/reuse* across projects, sharing with stakeholders through *tailored interfaces*, and ongoing *review/update* prompted by *automated alerts*

Clinical Evidence Collaborations

- Evidence packets to inform development and update of *ordersets* (institution-specific care protocols)
  - Tailored to *specific patient populations* and disease groups (e.g., diabetes, well child visits)

- Focused syntheses of *laboratory test utility* to support decision-making around institutional test offerings
  - Part of a VUMC effort to *improve care value* through reductions in unnecessary or inappropriate testing
Currently, a CKM information scientist is working on a “systematic-like” review for a set of clinical guidelines for a pediatric condition for which no definitive guidelines are available.

### Defining Review Type

| Systematic Review | “Systematic-Like” Review | Comprehensive Topic Review | Patient-Specific Precision investigations |

### Defining Level of Assistance

<table>
<thead>
<tr>
<th>Level I</th>
<th>Level II</th>
<th>Level III</th>
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<tbody>
<tr>
<td>Includes:</td>
<td>Includes all of Level I, plus:</td>
<td>Includes all of Level II, plus:</td>
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<tr>
<td>• Systematic search of the literature</td>
<td>• Tabulate extracted data into summary tables</td>
<td>• Drafting a detailed protocol that accurately documents the entirety of guideline development methodology, to ensure transparency and reproducibility</td>
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<tr>
<td>o Multiple databases + grey literature</td>
<td>• Consult users on evidence grading methodology</td>
<td>• Create and standardize quality assessment methods using agreed upon criteria</td>
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<tr>
<td>o Hand-searching</td>
<td>• Organizing and tabulating relevant data by key questions/outcomes to provide structure for narrative</td>
<td>o Grade quality of evidence</td>
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<tr>
<td>• EndNote citation database development</td>
<td>• Screen and selection of articles at both abstract &amp; full text level for inclusion based on predetermined eligibility criteria</td>
<td>o Grade strength of recommendations</td>
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<tr>
<td>• Devising screening questions for abstract and full text article review</td>
<td>o Mapping articles to expert-defined key questions</td>
<td>• Provide support during working group teleconferences throughout the process</td>
</tr>
<tr>
<td>• Screening and selection of articles at both abstract &amp; full text level for inclusion based on predetermined eligibility criteria</td>
<td>• Extracting data from selected studies for subject expert defined data points of interest</td>
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<tr>
<td>o Mapping articles to expert-defined key questions</td>
<td>• Author the portion of the methods section pertaining to searching &amp; evidence gathering for final manuscript</td>
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Fox et al. “Why Equating All Evidence Searches to Systematic Reviews Defies Their Role in Information Seeking.” Accepted for publication in the Journal of the Medical Library Association, October 2019.
Filling Systems Implementation Knowledge Gaps

- Health information technology and informatics teams require information on best practices for electronic health record (EHR) implementation.
- This information is often difficult to find and widely distributed in non-traditional publication formats (e.g., vendor-specific user forums, white papers).
- Given the knowledge gap in the EHR implementation literature, CKM was charged with providing and organizing an evidence-based framework around implementation decisions, such as configuration of the testing environment and role-based security profiles.

Image by pixel2013 from Pixabay

Research Collaborations

**CKM Research Background:** Conducted original research to develop and evaluate best practices for patient communication and professional education informed by *health literacy* and *learning styles* (2011).

**CKM expertise sought by research partners:**
- intimate knowledge of the biomedical literature;
- knowledge of research methods/study design;
- ability to organize information extracted from various sources into packaged, consumable, and sharable knowledge products.

• Multidisciplinary team working to identify and evaluate existing drugs with potential for repurposing

• CKM information scientist conducts evidence reviews to validate identified relationships between genetic mutation and phenotype

• Requires understanding of protein expression, structure, and function

• Goal is to save time and money
Social & Behavioral Determinants of Health

- **Study 1**: Feasibility study (online sample)
  - Used measures recommended by the Institute of Medicine (now National Academy of Medicine) Committee
  - Harmonized items and assessed effect of question order, completion time rates, and non-response patterns

- **Study 2**: Replication study (online sample)
  - Replicated feasibility findings for NAM instrument
  - Found an association between the measures and self-reported health

- **Study 3**: Feasibility study in the community clinic setting
  - Combined items from the NAM instrument and the Protocol for Responding to and Assessing Patients' Assets, Risks, and Experiences (PRAPARE)
All of Us Research Program

A federally-funded research study to investigate how individual genetic, lifestyle, behavioral, and environmental factors impact health.

- Contributed to development of participant survey instruments, including locating details on characterization and validation of survey items
- Provided advice on versioning tools
- Conducted pilot interviews of potential participants
- Completed a competitive landscape analysis to support the design of a “Research Hub” for data access

Image credit: https://www.joinallofus.org/en/how-to-join

Faster Together

• Collaboration with the VUMC Recruitment Innovation Center

• Goal is educating clinical trial recruiters on best practices for enrollment of underrepresented populations

• Information scientists:
  • evaluated online course platforms
  • substantiated and ensured clear communication of course content
  • implemented the course in Coursera

https://www.coursera.org/learn/recruitment-minorities-clinical-trials
Multiple points of feedback collected from:

- External collaborators
  - Assessment of impact on outcomes such as “knowledge gained” and “improved patient care” using Likert scale

- Peer information scientists
  - 360-degree-like review
  - Reviewers identified based on project assignments from the previous fiscal year
### Sample review forms

#### Peer evaluation

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<td>1) works well as a member of the team</td>
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<td>2) demonstrates adaptability or flexibility on projects</td>
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<td>3) communicates effectively</td>
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<td>4) listens well to others</td>
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<td>5) produces high quality work</td>
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<td>6) is organized</td>
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<tr>
<td>7) offers creative ideas to solve problems</td>
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<tr>
<td>8) displays good interpersonal skills</td>
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#### Collaboration evaluation

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<tr>
<td>1) willingness to offer higher expertise to projects in which you both have participated</td>
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<td>2) accountability (measured by an ability to deliver, in a timely fashion, tasks to which have been agreed upon)</td>
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<tr>
<td>3) willingness to acknowledge the diverse expertise of all members of the team and to agree on how best to make it work to the full success of the project/task assigned</td>
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<td>4) contributions to scholarly communication products through either writing, editing, oral presentation, or quality assurance</td>
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A Knowledge Management Infrastructure

- CKM provides a central and reliable source for producing, documenting, and updating the *knowledge that catalyzes* various components of research and practice.

- Adding knowledge to the overall existing organizational infrastructure *makes the institution stronger*.

- This infrastructure *bolsters the institution against changes* that naturally arise in a learning health system that is constantly evolving.