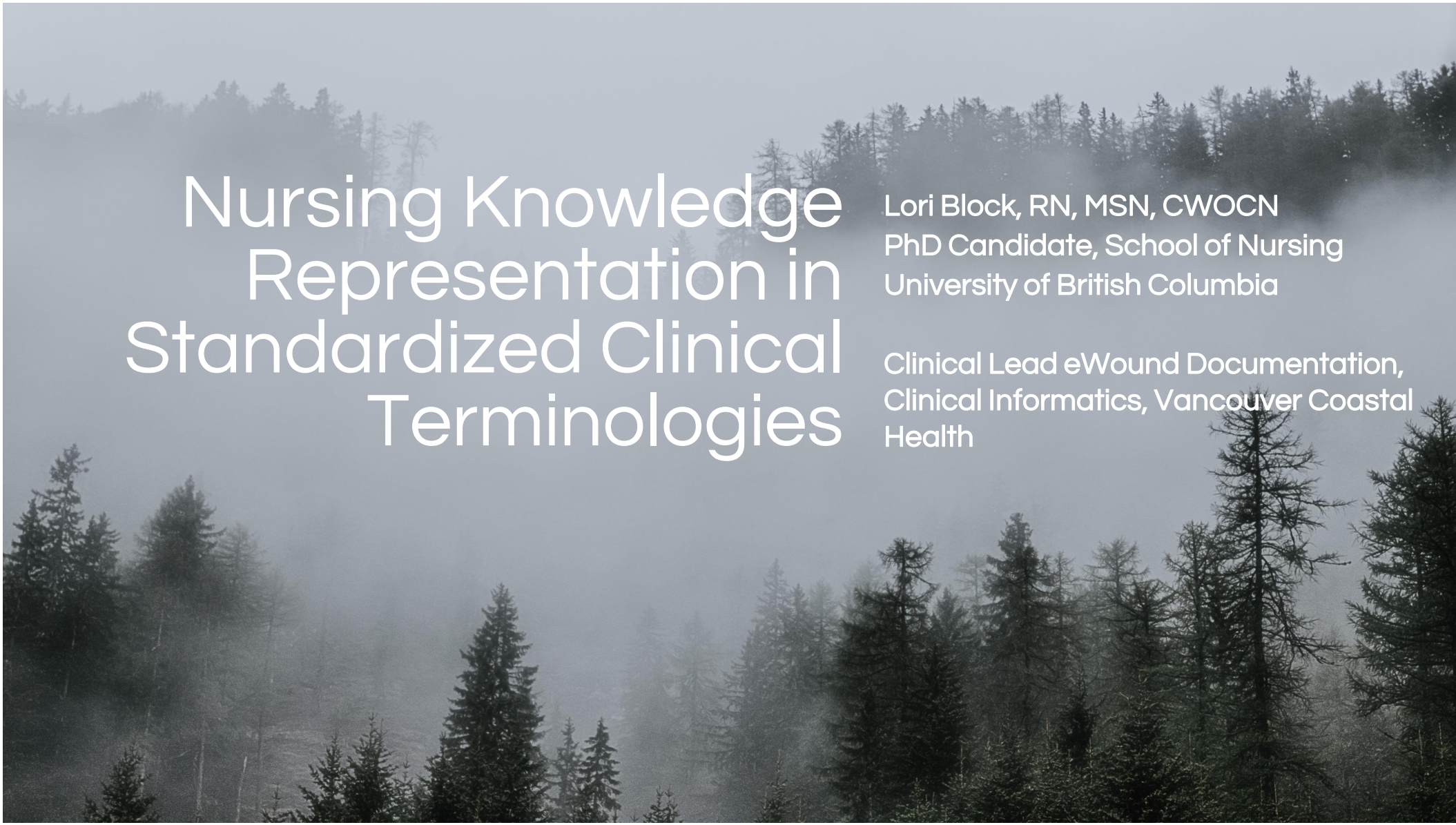


Nursing Knowledge Representation in Standardized Clinical Terminologies

Lori Block, RN, MSN, CWOCN
PhD Candidate, School of Nursing
University of British Columbia

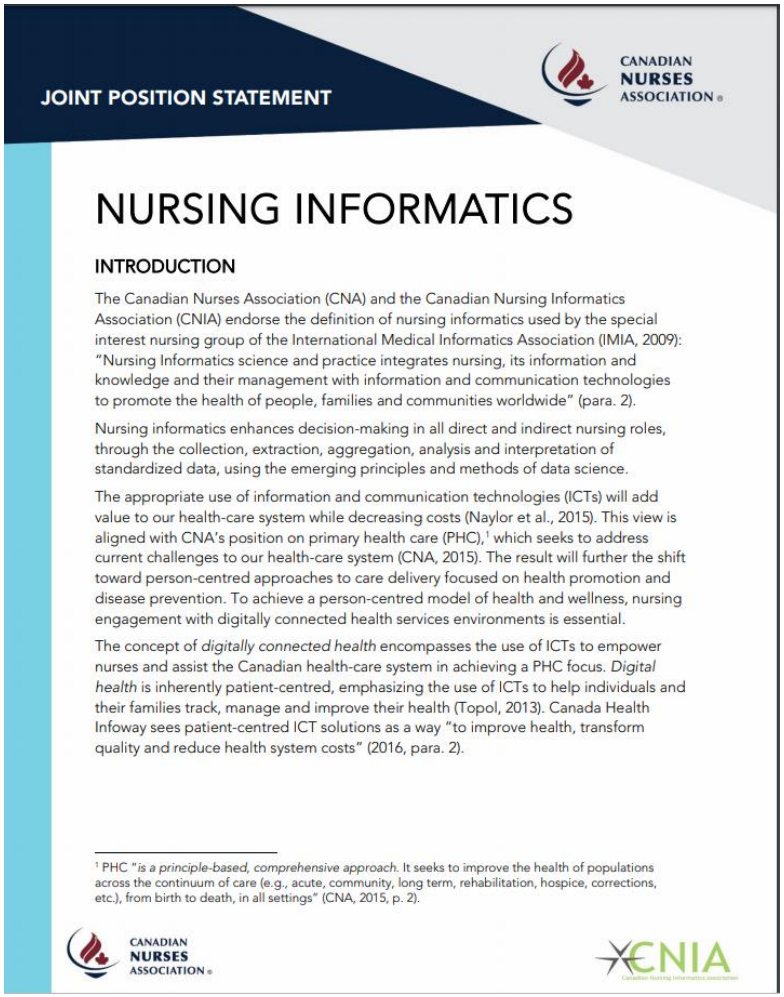
Clinical Lead eWound Documentation,
Clinical Informatics, Vancouver Coastal Health

Objectives

To introduce participants to nursing knowledge representation in:

- SNOMED CT
- ICNP
- LOINC Nursing Physiological Assessment Panel
- C-HOBIC

-CNA & CNIA Joint Position Statement Nursing Informatics (2017)



JOINT POSITION STATEMENT

CANADIAN NURSES ASSOCIATION

NURSING INFORMATICS

INTRODUCTION

The Canadian Nurses Association (CNA) and the Canadian Nursing Informatics Association (CNIA) endorse the definition of nursing informatics used by the special interest nursing group of the International Medical Informatics Association (IMIA, 2009): "Nursing Informatics science and practice integrates nursing, its information and knowledge and their management with information and communication technologies to promote the health of people, families and communities worldwide" (para. 2).

Nursing informatics enhances decision-making in all direct and indirect nursing roles, through the collection, extraction, aggregation, analysis and interpretation of standardized data, using the emerging principles and methods of data science.

The appropriate use of information and communication technologies (ICTs) will add value to our health-care system while decreasing costs (Naylor et al., 2015). This view is aligned with CNA's position on primary health care (PHC),[1] which seeks to address current challenges to our health-care system (CNA, 2015). The result will further the shift toward person-centred approaches to care delivery focused on health promotion and disease prevention. To achieve a person-centred model of health and wellness, nursing engagement with digitally connected health services environments is essential.

The concept of *digitally connected health* encompasses the use of ICTs to empower nurses and assist the Canadian health-care system in achieving a PHC focus. *Digital health* is inherently patient-centred, emphasizing the use of ICTs to help individuals and their families track, manage and improve their health (Topol, 2013). Canada Health Infoway sees patient-centred ICT solutions as a way "to improve health, transform quality and reduce health system costs" (2016, para. 2).

[1] PHC "*is a principle-based, comprehensive approach*. It seeks to improve the health of populations across the continuum of care (e.g., acute, community, long term, rehabilitation, hospice, corrections, etc.), from birth to death, in all settings" (CNA, 2015, p. 2).

CANADIAN NURSES ASSOCIATION

CNIA

Vocabulary Standards

Broadly, this work is oriented towards the identification and use of **rich clinical knowledge** and its iterative manipulation to create related **computer readable knowledge**.

(Saba and McCormick 2011)

Knowledge Representation

Lori Hobbis Age 5

René Magritte (1898-1967)


Standardized Clinical
Terminologies

Medicine

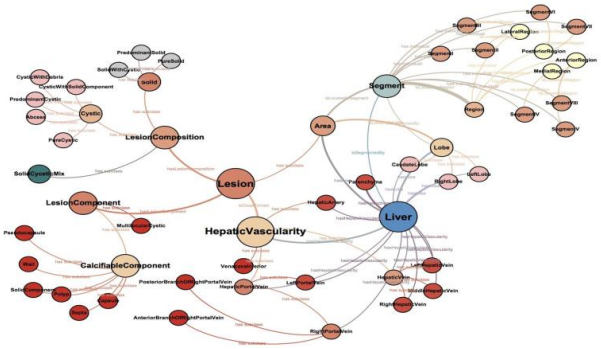
Nursing

Pharmacy

Lab

Pressure Injury

4578997



Terminologies used by Nursing

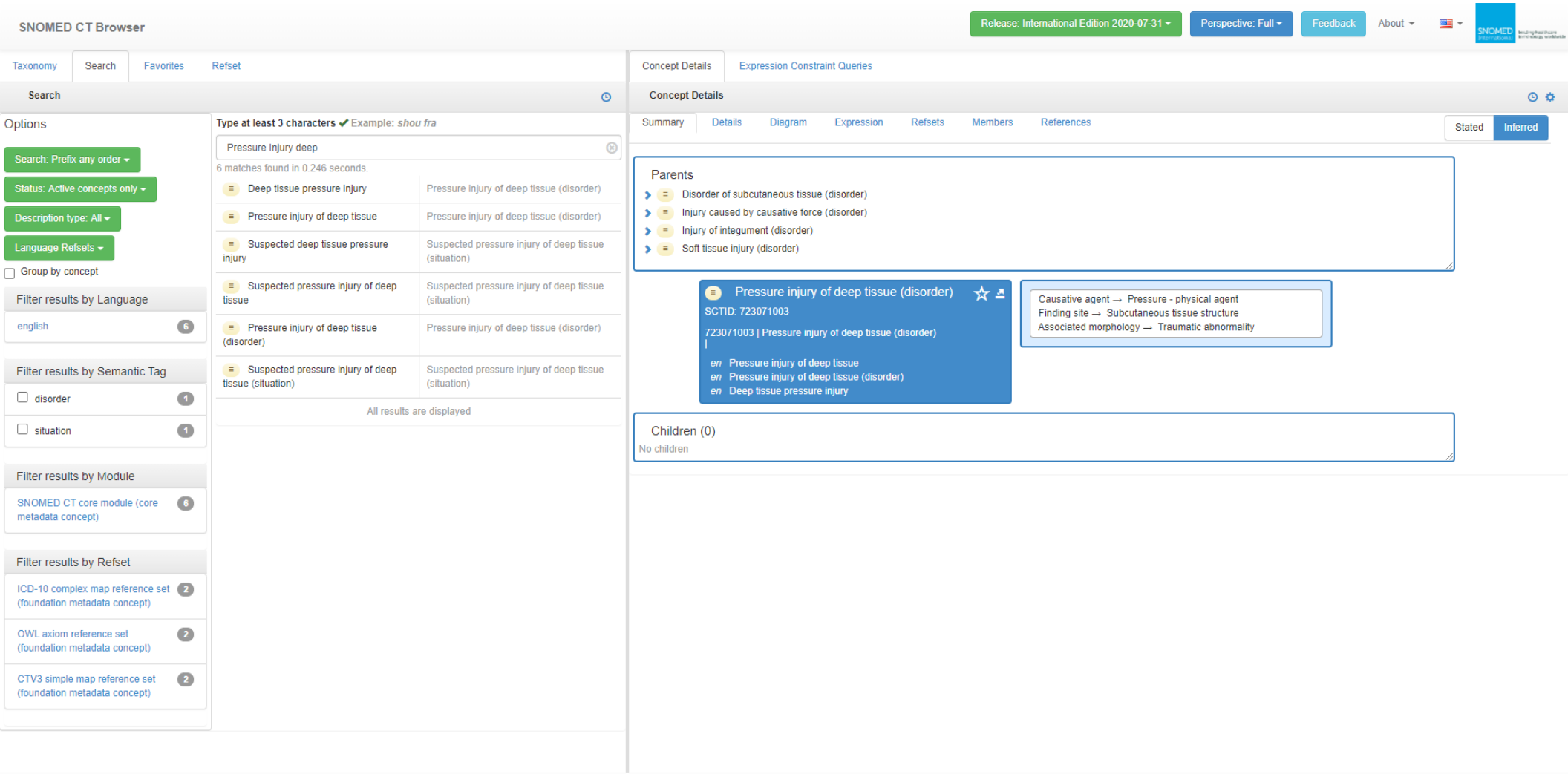
Terminology	Latest Update via UMLS	Original Publication Date	Publication Schedule
SNOMED Clinical Terms (SNOMED CT)	2017	SNOMED (1975) SNOMED II (1979) SNOMED CT (2002)	Twice annually: January and July.
Logical Observation Identifiers Names and Codes (LOINC)	2017	1994	Twice annually: December and June.
Alternative Billing Concepts (ABC) Codes	2009	2000	Schedule based on availability of resources.
Clinical Care Classification (CCC) System	2012	1991	CCC System National Scientific Advisory Board meets annually.
International Classification for Nursing Practice (ICNP)	2015	Alpha v. (1996)	Released in May or June of the second year.
NANDA International (NANDA-I)	2002	1973	Every three years.
Nursing Interventions Classification System (NIC)	2008	1992	Every five years.
Nursing Outcomes Classification (NOC)	2008	1997	Every five years.
Omaha System	2005	1975	Reviewed every two years.
Perioperative Nursing Data Set (PNDS)	2011	1999	Every five years.
Nursing Minimum Data Set (NMDS)	NMDS is not in UMLS.	1983	No
Nursing Management Minimum Data Set (NMMDS)	NMMDS is not in UMLS. *However, it is fully encoded with LOINC, which is in UMLS.*	1996/1997	No

The Office of the National Coordinator for Health Information Technology (2017). Standard nursing terminologies: A landscape analysis. Retrieved from https://www.healthit.gov/sites/default/files/snt_final_05302017.pdf

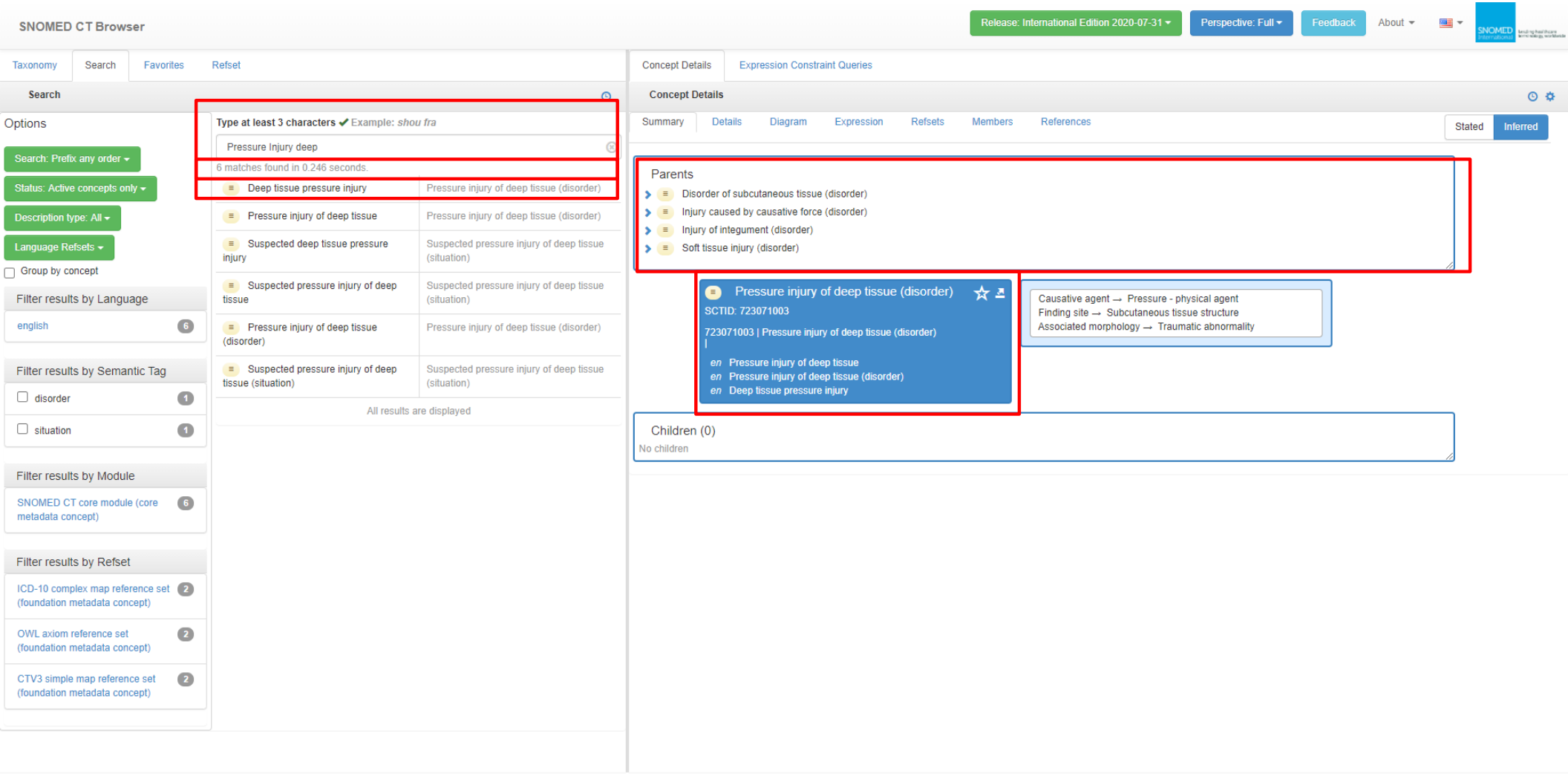
SNOMED CT

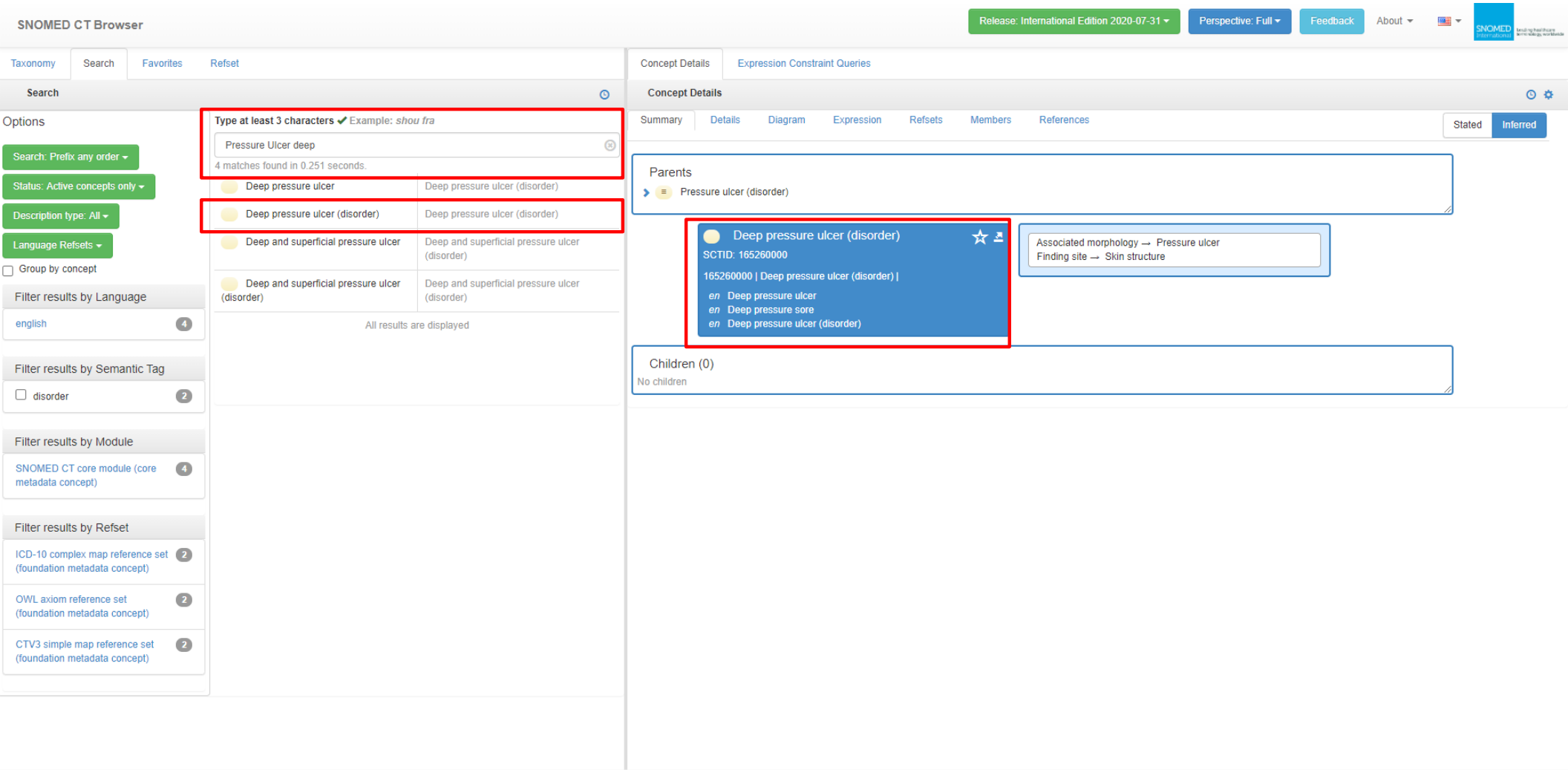
- Largest, International, Multi-disciplinary Standardized Clinical Terminology
- 350,000+ concepts and 150,000+ synonyms
- SNOMED CT Canadian Edition contains additional concepts from the International Release (e.g., Canadian French Translation of Concepts)

SNOMED International



https://browser.ihtsdotools.org/?


SNOMED CT Browser
Release: International Edition 2020-07-31
Perspective: Full
Feedback
About
Taxonomy
Search
Favorites
Refset
Concept Details
Expression Constraint Queries
Search
Concept Details
Options
Search: Prefix any order
Status: Active concepts only
Description type: All
Language Refsets
Group by concept
Filter results by Language
english 6
Filter results by Semantic Tag
disorder 1
situation 1
Filter results by Module
SNOMED CT core module (core metadata concept) 6
Filter results by Refset
ICD-10 complex map reference set (foundation metadata concept) 2
OWL axiom reference set (foundation metadata concept) 2
CTV3 simple map reference set (foundation metadata concept) 2
Type at least 3 characters ✔ Example: shou fra
Pressure Injury deep
6 matches found in 0.246 seconds.
Deep tissue pressure injury
Pressure injury of deep tissue (disorder)
Pressure injury of deep tissue
Pressure injury of deep tissue (disorder)
Suspected deep tissue pressure injury
Suspected pressure injury of deep tissue (situation)
Suspected pressure injury of deep tissue
Suspected pressure injury of deep tissue (situation)
Pressure injury of deep tissue (disorder)
Pressure injury of deep tissue (disorder)
Suspected pressure injury of deep tissue (situation)
Suspected pressure injury of deep tissue (situation)
All results are displayed
Summary
Details
Diagram
Expression
Refsets
Members
References
Stated
Inferred
Parents
Disorder of subcutaneous tissue (disorder)
Injury caused by causative force (disorder)
Injury of integument (disorder)
Soft tissue injury (disorder)
Pressure injury of deep tissue (disorder)
SCTID: 723071003
723071003 | Pressure injury of deep tissue (disorder) |
en Pressure injury of deep tissue
en Pressure injury of deep tissue (disorder)
en Deep tissue pressure injury
Causative agent → Pressure - physical agent
Finding site → Subcutaneous tissue structure
Associated morphology → Traumatic abnormality
Children (0)
No children


SNOMED CT Browser
Release: International Edition 2020-07-31
Perspective: Full
Feedback
About
Taxonomy
Search
Favorites
Refset
Concept Details
Expression Constraint Queries
Search
Concept Details
Options
Search: Prefix any order
Status: Active concepts only
Description type: All
Language Refsets
Group by concept
Filter results by Language
english 4
Filter results by Semantic Tag
disorder 2
Filter results by Module
SNOMED CT core module (core metadata concept) 4
Filter results by Refset
ICD-10 complex map reference set (foundation metadata concept) 2
OWL axiom reference set (foundation metadata concept) 2
CTV3 simple map reference set (foundation metadata concept) 2
Type at least 3 characters ✔ Example: shou fra
Pressure Ulcer deep
4 matches found in 0.251 seconds.
Deep pressure ulcer
Deep pressure ulcer (disorder)
Deep pressure ulcer (disorder)
Deep pressure ulcer (disorder)
Deep and superficial pressure ulcer
Deep and superficial pressure ulcer (disorder)
Deep and superficial pressure ulcer (disorder)
Deep and superficial pressure ulcer (disorder)
All results are displayed
Summary
Details
Diagram
Expression
Refsets
Members
References
Stated
Inferred
Parents
Pressure ulcer (disorder)
Deep pressure ulcer (disorder)
SCTID: 165260000
165260000 | Deep pressure ulcer (disorder) |
en Deep pressure ulcer
en Deep pressure sore
en Deep pressure ulcer (disorder)
Associated morphology → Pressure ulcer
Finding site → Skin structure
Children (0)
No children

International Classification for Nursing Practice (ICNP)

Developed & distributed by the International Council of Nurses

Knowledge Representation of Nursing Diagnosis, Intervention, and Outcomes

WHO recognized terminology representing nursing practice internationally

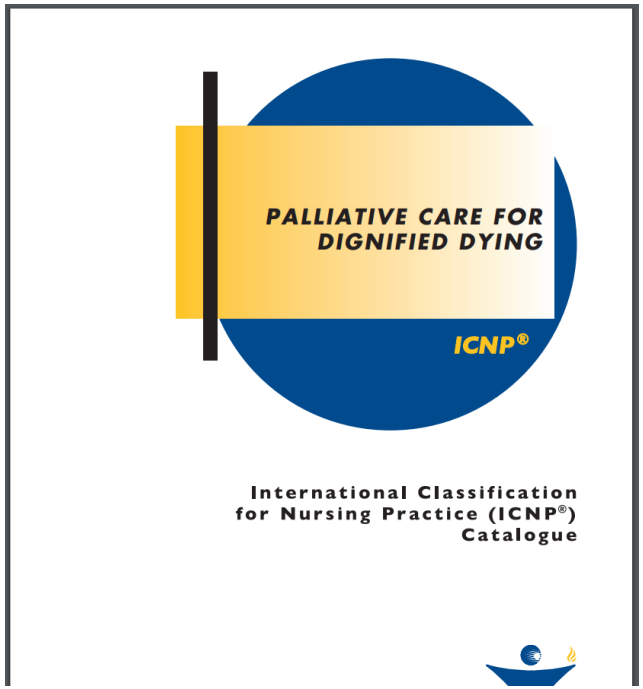
Benefits:

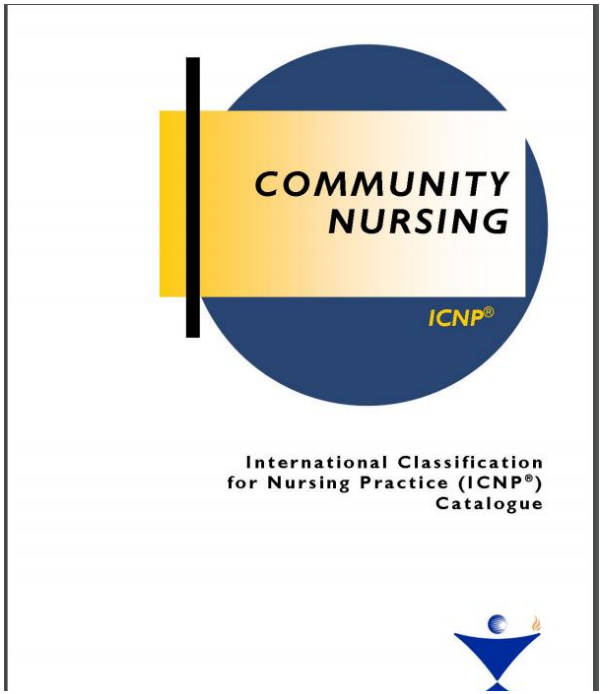
- Increases nursing visibility
- Comprehensive & evolving
- Available in 18 languages (French & English)
- Operationalize large scale reporting of nursing practice

ICNP cross-mapped to SNOMED

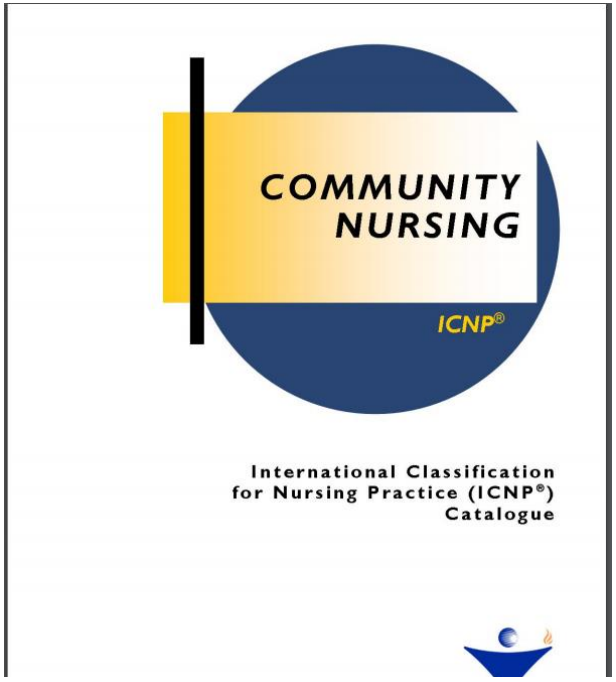
9 – Catalogues representing focused areas of nursing practice

FREE to download (link)





ICNP in Practice

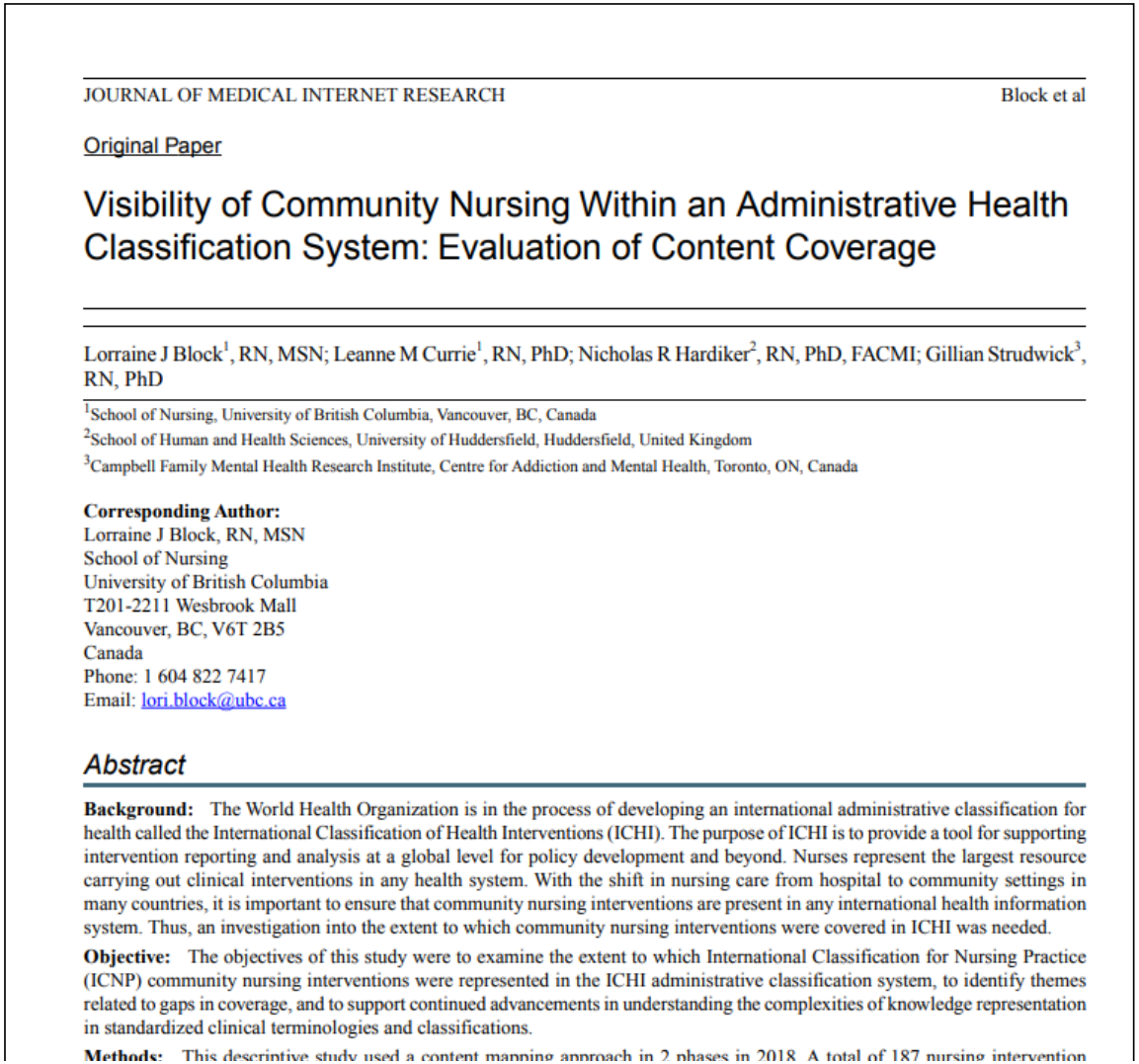


Skin / Wound Care		
	10030472	Applying Compression Bandage
	10030486	Applying Elastic Stockings
	10030747	Assessing Self Care Of Skin
	10030799	Assessing Wound
	10031117	Diabetic Ulcer Care
	10035147	Compression Therapy
	10031592	Invasive Device Site Care
	10031690	Malignant Wound Care
	10032420	Pressure Ulcer Care
	10040224	Pressure Ulcer Prevention
	10032630	Removing Suture
	10032648	Removing Wound Clip
	10032863	Surgical Wound Care
	10032871	Suture Wound
	10033029	Teaching About Self Care Of Skin
	10034961	Teaching About Wound Care
	10034974	Teaching About Wound Healing
	10033208	Traumatic Wound Care

ICNP in Research

Community ICNP Catalogue Interventions mapped to the World Health Organization, International Classification of Health Intervention (beta-2)

- No clinical interventions specifically describing "death" or "dying" or "palliative"



JOURNAL OF MEDICAL INTERNET RESEARCH Block et al

Original Paper

Visibility of Community Nursing Within an Administrative Health Classification System: Evaluation of Content Coverage

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[2]School of Human and Health Sciences, University of Huddersfield, Huddersfield, United Kingdom
[3]Campbell Family Mental Health Research Institute, Centre for Addiction and Mental Health, Toronto, ON, Canada

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Canada
Phone: 1 604 822 7417
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Abstract

Background: The World Health Organization is in the process of developing an international administrative classification for health called the International Classification of Health Interventions (ICHI). The purpose of ICHI is to provide a tool for supporting intervention reporting and analysis at a global level for policy development and beyond. Nurses represent the largest resource carrying out clinical interventions in any health system. With the shift in nursing care from hospital to community settings in many countries, it is important to ensure that community nursing interventions are present in any international health information system. Thus, an investigation into the extent to which community nursing interventions were covered in ICHI was needed.

Objective: The objectives of this study were to examine the extent to which International Classification for Nursing Practice (ICNP) community nursing interventions were represented in the ICHI administrative classification system, to identify themes related to gaps in coverage, and to support continued advancements in understanding the complexities of knowledge representation in standardized clinical terminologies and classifications.

Methods: This descriptive study used a content mapping approach in 2 phases in 2018. A total of 187 nursing intervention

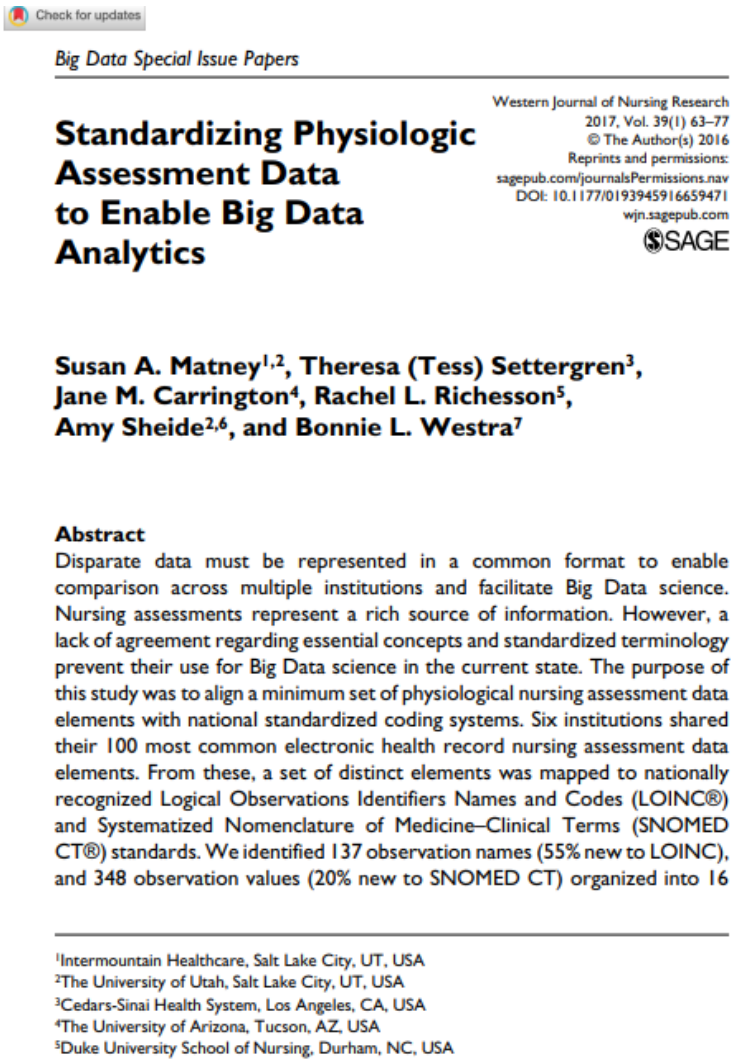

Standardized
Assessments -
Codified

LOINC

Logical Observation Identifiers Names and Codes (LOINC)

Concepts representing laboratory, health measurements, observations, and documents

LOINC has several 'panels' which contain collections/sets of concepts



Check for updates

Big Data Special Issue Papers

Standardizing Physiologic Assessment Data to Enable Big Data Analytics

Western Journal of Nursing Research
2017, Vol. 39(1) 63–77

DOI: 10.1177/0193945916659471
wjn.sagepub.com
SAGE

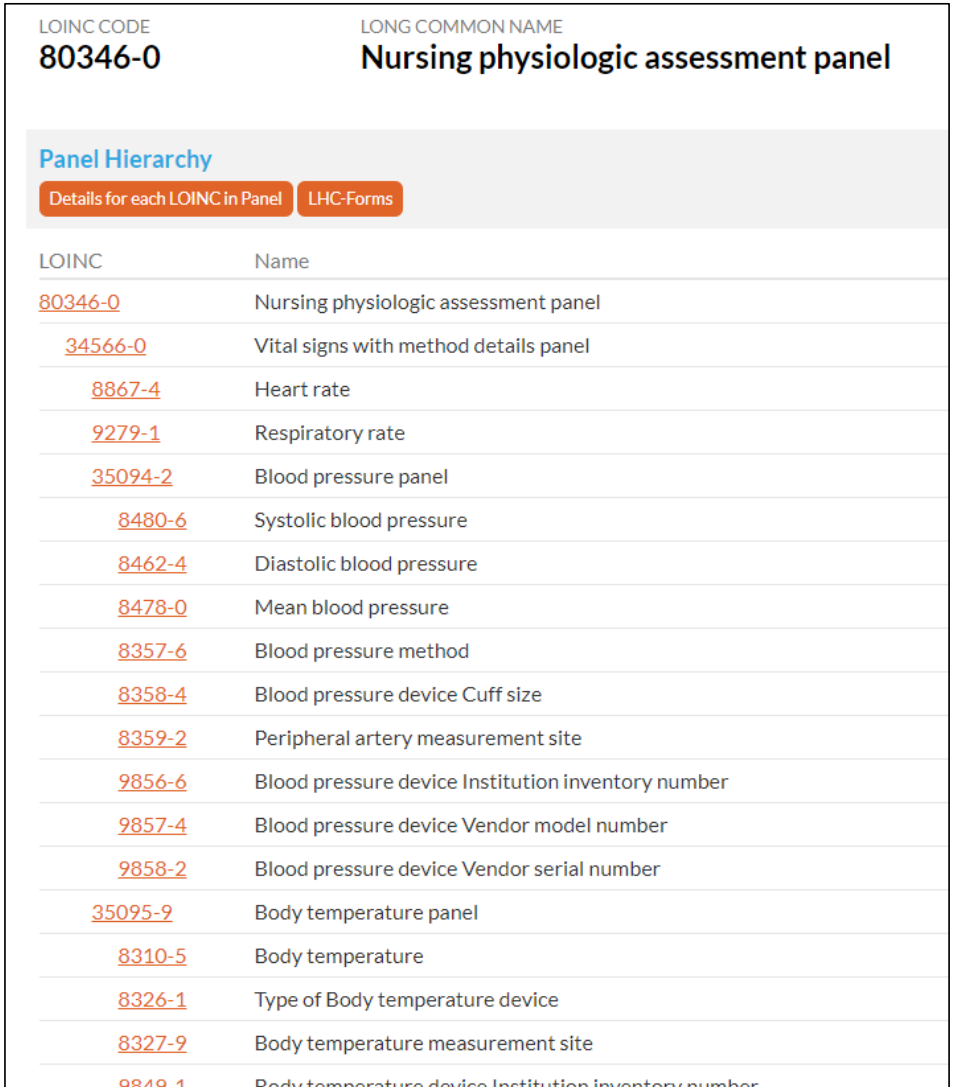
Susan A. Matney[1,2], Theresa (Tess) Settergren[3], Jane M. Carrington[4], Rachel L. Richesson[5], Amy Sheide[2,6], and Bonnie L. Westra[7]

Abstract

Disparate data must be represented in a common format to enable comparison across multiple institutions and facilitate Big Data science. Nursing assessments represent a rich source of information. However, a lack of agreement regarding essential concepts and standardized terminology prevent their use for Big Data science in the current state. The purpose of this study was to align a minimum set of physiological nursing assessment data elements with national standardized coding systems. Six institutions shared their 100 most common electronic health record nursing assessment data elements. From these, a set of distinct elements was mapped to nationally recognized Logical Observations Identifiers Names and Codes (LOINC®) and Systematized Nomenclature of Medicine–Clinical Terms (SNOMED CT®) standards. We identified 137 observation names (55% new to LOINC), and 348 observation values (20% new to SNOMED CT) organized into 16

[1]Intermountain Healthcare, Salt Lake City, UT, USA
[2]The University of Utah, Salt Lake City, UT, USA
[3]Cedars-Sinai Health System, Los Angeles, CA, USA
[4]The University of Arizona, Tucson, AZ, USA
[5]Duke University School of Nursing, Durham, NC, USA

LOINC Nursing Physiologic Assessment Panel



LOINC CODE
80346-0

LONG COMMON NAME
Nursing physiologic assessment panel

Panel Hierarchy

Details for each LOINC in Panel | LHC-Forms

LOINC	Name
80346-0	Nursing physiologic assessment panel
34566-0	Vital signs with method details panel
8867-4	Heart rate
9279-1	Respiratory rate
35094-2	Blood pressure panel
8480-6	Systolic blood pressure
8462-4	Diastolic blood pressure
8478-0	Mean blood pressure
8357-6	Blood pressure method
8358-4	Blood pressure device Cuff size
8359-2	Peripheral artery measurement site
9856-6	Blood pressure device Institution inventory number
9857-4	Blood pressure device Vendor model number
9858-2	Blood pressure device Vendor serial number
35095-9	Body temperature panel
8310-5	Body temperature
8326-1	Type of Body temperature device
8327-9	Body temperature measurement site
9849-1	Body temperature device Institution inventory number

C-HOBIC

- Canadian Health Outcomes for Better Information and Care (C-HOBIC)
- Standardized assessment completed by nurses on patient admission (24 questions) and discharge (24 questions)
- Used across the continuum of care (acute, long term care, community)
- Cross Mapped to SNOMED CT and ICNP

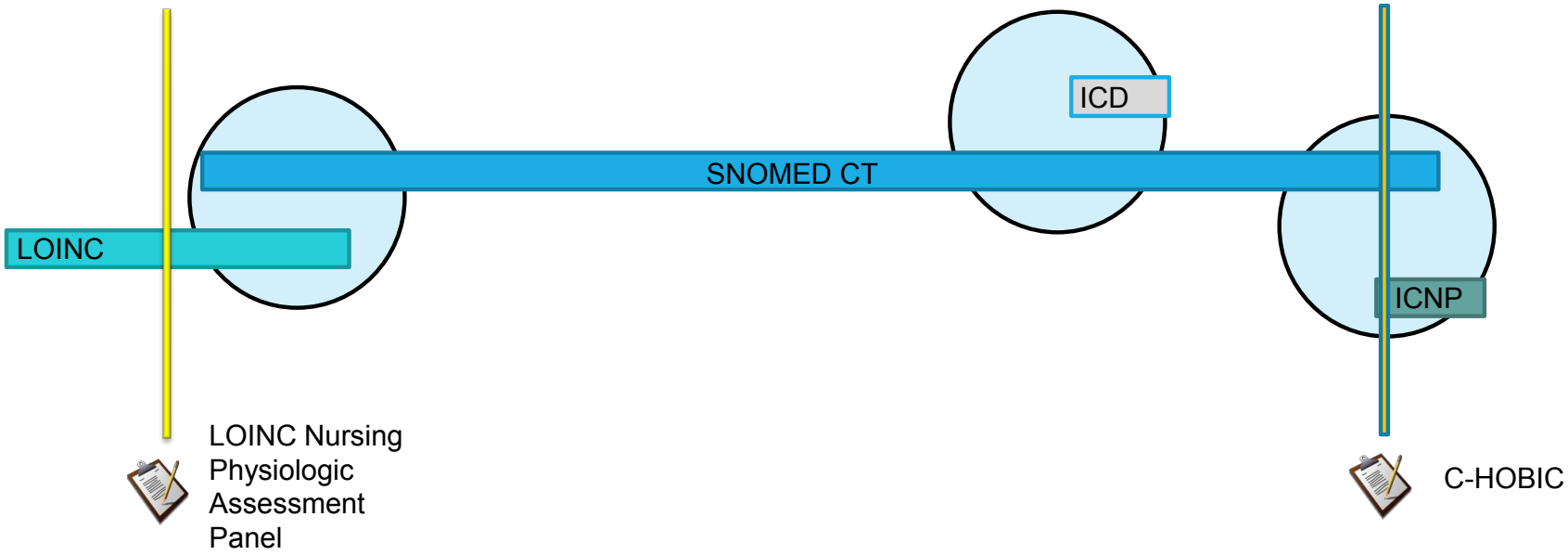
C-HOBIC

Benefits:

- Standardize assessment of patient-centered outcomes
- Nursing sensitive data
- Ability to compare patient status between admission and discharge

Data elements	Measure
Functional status and continence (ADLs/IADLs)	
Bathing	interRAI AC
Personal hygiene	interRAI AC
Walking	interRAI AC
Toilet transfer	interRAI AC
Toilet use	interRAI AC
Bed mobility	interRAI AC
Dressing	interRAI AC
Eating	interRAI AC
Bladder continence	interRAI AC
Symptoms	
Pain — frequency	interRAI AC
Pain — intensity	0–10 scale
Fatigue	interRAI AC
Dyspnea	interRAI AC
Nausea	interRAI AC
Safety	
Falls	interRAI AC
Pressure ulcer	interRAI AC
Therapeutic self-care	
Knowledge of current medications	Sidani and Doran tool
Knowledge about why you are taking current medications	Sidani and Doran tool
Ability to take medications as prescribed	Sidani and Doran tool
Recognition of changes in body (symptoms) related to health	Sidani and Doran tool
Carry out treatments to manage symptoms	Sidani and Doran tool
Ability to do everyday things like bathing, shopping	Sidani and Doran tool
Someone to call if help is needed	Sidani and Doran tool
Knowledge of whom to contact in case of a medical emergency	Sidani and Doran tool

Perspective



Benefits

Semantic Interoperability

Data Analytics

Building Blocks for Advanced Programming

Advanced Uses

Clinical Decision Support Systems

Al-Hablani, B. (2017). The use of automated SNOMED CT clinical coding in clinical decision support systems for preventive care. *Perspectives in Health Information Management*, 14(Winter),

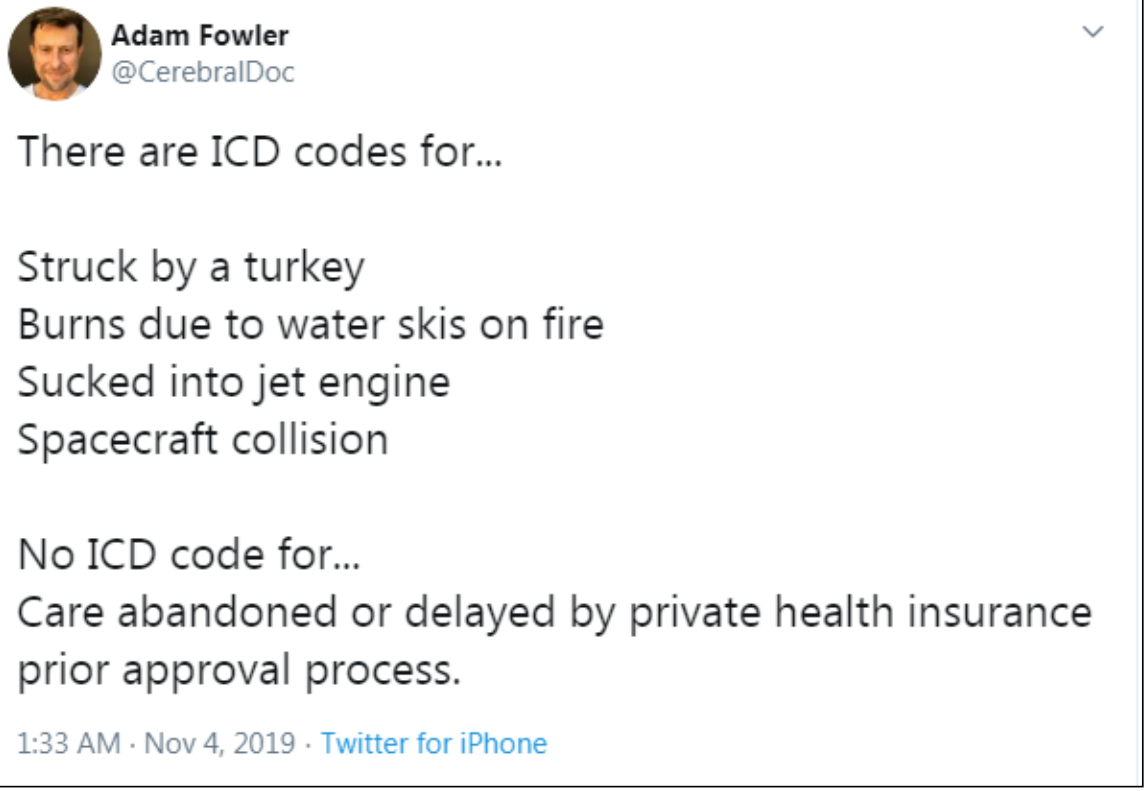
Natural Language Processing

Topaz, M. et al. (2016). Automated identification of wound information in clinical notes of patients with heart diseases: Developing and validating a natural language processing application. *International Journal of Nursing Studies*, 64, 25-31. doi:10.1016/j.ijnurstu.2016.09.013

Machine Learning/Predictive Analytics

Golas, S. B., Shibahara, T., Agboola, S., Otaki, H., Sato, J., Nakae, T., . . . Jethwani, K. (2018). A machine learning model to predict the risk of 30-day readmissions in patients with heart failure: A retrospective analysis of electronic medical records data. *BMC Medical Informatics and Decision Making, 18*(1), 44-17. doi:10.1186/s12911-018-0620-z

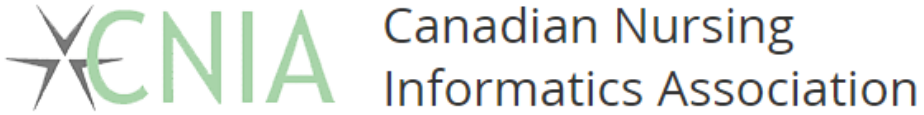
Challenges?


Adam Fowler
@CerebralDoc
There are ICD codes for...
Struck by a turkey
Burns due to water skis on fire
Sucked into jet engine
Spacecraft collision
No ICD code for...
Care abandoned or delayed by private health insurance prior approval process.
1:33 AM · Nov 4, 2019 · Twitter for iPhone

"Hospital harm is likely under-reported, leading to an underestimate of the extent of the patient safety issues. If, for example, harm occurred and was recorded only in the nurse's notes, it would not be captured, as CIHI's coding standards stipulate that to be coded (and captured in the Hospital Harm data), diagnoses must be documented in the chart by a physician or the primary care provider."

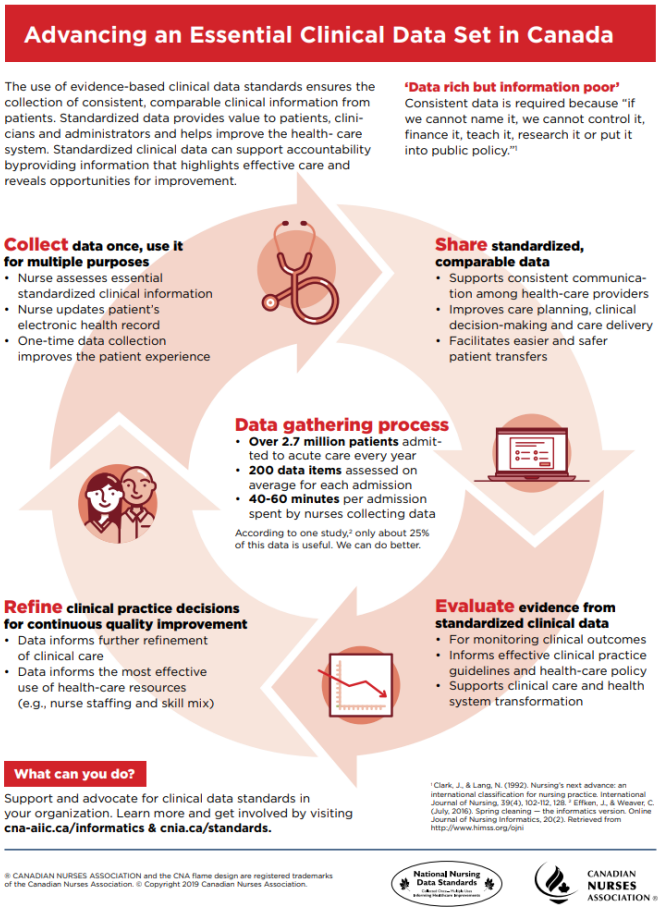
Ho, C., Jiang, J., Eastwood, C. A., Wong, H., Weaver, B., & Quan, H. (2017). Validation of two case definitions to identify pressure ulcers using hospital administrative data. *BMJ Open, 7*(8), e016438-e016438. doi:10.1136/bmjopen-2017-016438

Opportunities



National Nursing Data Standards Symposium

2016, 2017, 2018, 2019, 2020



Lori Block
Twitter: Lori_Block1
Lori.Block@ubc.ca

Recommended Resources

Cimino, J. J. (1998). "Desiderata for controlled medical vocabularies in the twenty-first century." Methods of information in medicine **37**(4-5): 394.

Nursing Data Standards – Canada (Canada Health Infoway)

SNOMED CT Starter Guide

ICNP Technical Implementation Guide

CASN Digital Health e-Learning Modules

CNIA Standards (cnia.ca/standards)