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**Canadian Initiative on Frailty and Aging
Initiative canadienne sur la fragilité et le
vieillessement**

A Systematic Review on Frailty in Older Persons

Sathya Karunanathan MSc (cand)

Christina Wolfson PhD

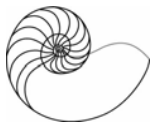
Howard Bergman MD

David Hogan MD

François Béland PhD

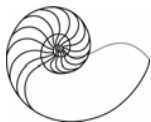
Objectives of the review

- ◆ Collate, critically review and synthesize the evidence and identify the gaps in the literature and in existing and emerging Canadian and international research
- ◆ Dissemination through publication of a series of papers



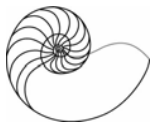
Glossary of terms

- ◆ A review is a general term that describes all attempts to synthesize the results and conclusions of two or more publications on a given topic
- ◆ A systematic review is a review that strives to identify and track down all literature on a given topic (within a specified time frame) also called an overview
- ◆ A meta-analysis is a systematic review which incorporates a specific statistical strategy for assembling the results of several studies into a single estimate



Strategy for the review

- ◆ Identified 11 Questions (domains) of interest
- ◆ Designated 2 Question Leaders for each domain
- ◆ Developed a standardised procedure to review the literature in each domain



Systematic Review Process

Step 1. Determining the objective of the question, inclusion/exclusion criteria and keywords for literature search.



Step 2. Literature search and article selection based on abstracts blinded for author and journal. Abstracts are eliminated only if both readers reject them.



Step 3. Articles selected in step 2 retrieved and read by the question leader and co-leader for their relevance for inclusion in the quality assessment process and for pearling of the reference list. Consensus opinion.



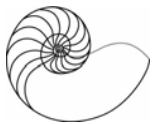
Step 4. Pearled articles from Step 3 retrieved, read and assessed by question leader and co-leader



Step 5. Quality assessment and data abstraction for selected articles blinded for authors, journal and sponsor

Sources, timeframe, scope

- ◆ Medline and Ageline
- ◆ 1997 to 2003
- ◆ Human
- ◆ English and French publications



Keywords

◆ Core keywords

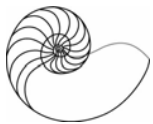
➤ aged

AND

➤ frail or frailty or vulnerable or vulnerability or healthy or successful aging or disability or disabled persons

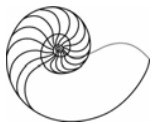
AND

◆ Question-specific keywords

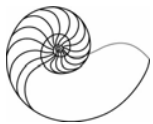


Flexibility

- ◆ Questions-Leaders are permitted to modify the search strategy to suit their Question-specific objectives
- ◆ This is particularly important when reviewing literature that covers a wide range of research domains (basic biological literature to health policy)



The Questions



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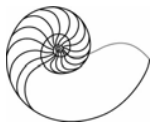
History, concept and current definitions of frailty

Question leader

- ◆ David Hogan (University of Calgary)

Research question

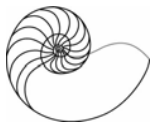
- ◆ What is the history of the frailty concept?
- ◆ What are the conceptual models current definitions and criteria?
- ◆ What is the basis for the definitions proposed- data, consensus, review, opinion?
- ◆ What are the implications of the various models and definitions for research and clinical care?



History, concept and current definitions of frailty (cont'd)

Report published:

- ◆ Hogan DB, MacKnight C, Bergman H. June 2003. Models, definitions, and criteria of frailty. *Aging Clin Exp Research*. Vol 15, suppl. to No. 3: 3-29



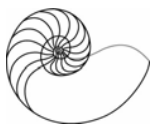
Biological basis of frailty

Question leaders

- ◆ Tamas Fulop (Université de Sherbrooke)
- ◆ Gustavo Duque (McGill University)
- ◆ David Hogan (University of Calgary)

Research questions

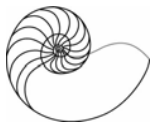
- ◆ What are the biological and physiological determinants of frailty?
- ◆ How can these determinants be used to understand, define, predict and characterize frailty?



Biological basis of frailty (cont'd)

Question-specific keywords

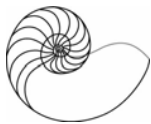
- ◆ BIOLOGY, biological markers or biomarkers
- ◆ Ascorbic acid or vitamin a or vitamin e or glutathione or PON or antioxidants
- ◆ Free radicals or nitric oxide or oxidants or hydrogen peroxide, oxidative Stress
- ◆ Cardiovascular diseases, blood coagulation
- ◆ Interleukin-1 or interleukin-6 or tumor necrosis factor
- ◆ Nitrogen oxides or nitric oxide or nitrous oxide or Lipoproteins, LDL or Receptors, LDL or oxidized ldl or Nitric-Oxide Synthase or eNOS



Biological basis of frailty (cont'd)

Question-specific keywords (contd')

- ◆ GENETICS, GENOME, GENES or Genes.mp. or telomerase or apolipoproteins or tumor necrosis factor or heat-shock proteins 70 or histocompatibility antigens or interleukin-10 or "polymorphism (genetics)" or telomere
- ◆ Glycosylation end products, advanced or HbA1c,
- ◆ INFLAMMATION, Infection, Immune response.mp., Prasterone or testosterone or estrogens or growth hormone or insulin-like growth factor i or insulin-like growth factor ii
- ◆ LIPIDS, OBESITTY, Protein-Energy, Malnutrition
- ◆ SARCOPENIA, PHYSIOLOGY, Physical performance.mp.
- ◆ Exercise or walking or muscle weakness or muscle strength or exercise or activities of daily living or functional decline



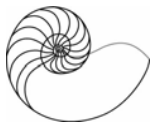
Social basis of frailty

Question leaders

- ◆ Margaret Penning (University of Victoria)
- ◆ François Béland (Université de Montréal)

Research questions

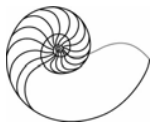
- ◆ How has frailty been conceptualized (defined, modeled) from a social perspective?
- ◆ How are social factors related to frailty (as determinants, mediators/modifiers and consequences) over the life course?



Social basis of frailty (cont'd)

Question-specific keywords (to be confirmed)

- ◆ definition, conceptualization, model, theory, determinants, predictors, ageing, life course, dependence, independence, autonomy, chronic illness, disability, functioning, consequences, outcomes



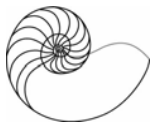
Prevalence of frailty

Question leaders

- ◆ Christina Wolfson (McGill University)
- ◆ Howard Bergman (McGill University)

Research Question

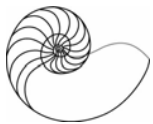
- ◆ What is the prevalence of frailty in the community dwelling elderly?
 - Does prevalence vary by sex, age, ethnic group, availability of health services, etc.?
- ◆ How does prevalence vary according to the definitions used?



Prevalence of frailty (cont'd)

Question-specific keyword

◆ Prevalence



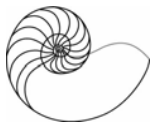
Risk factors for frailty

Question leaders

- ◆ Gary Naglie (University of Toronto)
- ◆ Sudeep Gill (Queen's University)

Research questions

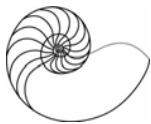
- ◆ What factors have been shown to predict frailty?
- ◆ What factors have been shown to predict successful aging?



Risk factors for frailty (cont'd)

Question-specific keywords

- ◆ Functional limitation (added to core keywords)
- ◆ Functional decline (added to core keywords)
- ◆ Risk factors
- ◆ Risk assessment
- ◆ Disability assessment
- ◆ Morbidity
- ◆ Comorbidity
- ◆ Health status
- ◆ Causality



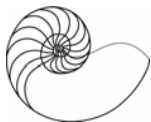
Impact of frailty

Question leaders

- ◆ Brigitte Santos-Eggiman (Université de Lausanne)
- ◆ Laurence Seematter-Bagnoud (Université de Lausanne)

Research Questions

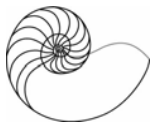
- ◆ What is the personal impact of frailty:
 - on the individuals?
 - on their relatives?
- ◆ What is the impact of frailty on health systems?
 - Does it increase health and social care needs, demand, utilization and costs?
 - What are the health sectors affected: ambulatory medical care, hospital care, emergency care, rehabilitation care, mental health care, long-term care: institutionalization, home care, home help?
 - What are the implications of frailty on needs for health professionals?



Impact of frailty (cont'd)

Question-specific keywords

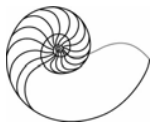
- ◆ Quality of life;
- ◆ Psychological, adaptation; psychological, stress; internal-external control, stress, adaptation; coping behavior.
- ◆ Social isolation; social life; social interaction.
- ◆ Income; employment; health expenditures
- ◆ Caregivers; spouses; relatives



Impact of frailty (cont'd)

Question-specific keywords (contd')

- ◆ **Health services / care / professions:** Ambulatory care facilities, hospitals, emergency medical services, rehabilitation centers, residential facilities, home care services, personal health services, home care agencies, community mental health services, mental health services, health services for the aged; Nursing care, geriatric nursing, home nursing, psychiatric nursing, rehabilitation nursing, community health nursing, long term care, rehabilitation, housekeeping, ambulatory care, medication; Physicians, nurses, caregivers, community health aides, home health aides, nurses' aides, health resources.
- ◆ **Measurements:** Length of stay, patient admission, patient readmission; Institutionalization; Needs assessment, health services needs and demand, need; Utilization; Health care costs, costs; Health care expenditures, expenditures.



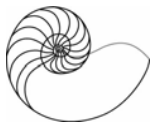
Identification of frailty

Question leaders

- ◆ Shelley Sternberg (Ben-Gurion University)
- ◆ Mark Clarfield (Ben-Gurion University)

Research Questions

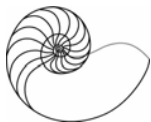
- ◆ Are there markers (clinical, biological) that can be measured in the asymptomatic normal population (eg grip strength in healthy persons) that predict frailty in the future?
- ◆ What are the clinical operational diagnostic criteria?



Identification of frailty (cont'd)

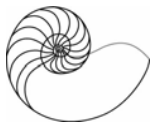
Research Questions (contd')

- ◆ What are the tools and instruments for the screening, diagnosis, and investigation of frailty at the primary care and specialty levels in all clinical settings?
- ◆ Are there measures of severity of frailty?



Identification (cont'd)

- ◆ geriatrics (methods)
- ◆ aging (physiology)
- ◆ risk assessment
- ◆ risk factors
- ◆ health status indicators
- ◆ disability evaluation
- ◆ forecasting
- ◆ patient care planning
- ◆ clinicals markers
- ◆ biological markers
- ◆ health surveys



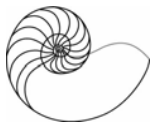
Prevention & management of frailty

Question leaders

- ◆ Christopher Patterson (McMaster University)
- ◆ John Feightner (University of Western Ontario)

Research Questions

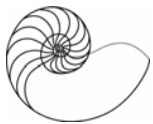
- ◆ Can interventions aimed at the general population prevent frailty (however it is defined)?



Prevention & Management (contd')

Research question (cont'd)

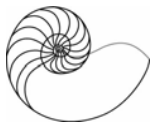
- ◆ Can interventions aimed at the general population prevent the consequences of frailty e.g. death, institutional admission, etc?
- ◆ Can interventions aimed at those who are frail or at risk of frailty, prevent the consequences of frailty?



Prevention & Management (contd')

Question-specific keywords

- ◆ preventive medicine
- ◆ preventive(text word)
- ◆ hominidae
- ◆ health promotion
- ◆ mass screening
- ◆ geriatric assessment



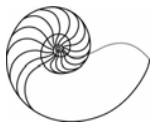
Environment and technology

Question leaders

- ◆ Geoff Fernie (University of Toronto)
- ◆ Brandi Row (Sunny Brook Women's College HSC)

Research Questions

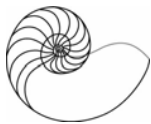
- ◆ What technological interventions have been demonstrated to increase quality of life and safety for frail older adults? Conversely, which technologies are not effective?
- ◆ What are the common characteristics of those technologies that have been found to be effective?
- ◆ What are the needs or opportunities for technologies to assist frail older adults and their caregivers that have not been adequately addressed?



Environment and Technology (cont'd)

Question-specific keywords

- ◆ technology
- ◆ environment: environment, environmental design, environmental monitoring
- ◆ assistive device(s) and self-help devices
- ◆ emergency response system(s)
- ◆ universal design
- ◆ home monitoring (crossed with aged only)
- ◆ information technology
- ◆ artificial intelligence
- ◆ e-health
- ◆ communication



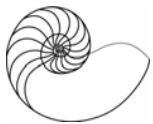
Health services for the frail

Question leaders

- ◆ Marcus Hollander (University of Victoria)
- ◆ François Béland (Université de Montréal)

Research Questions

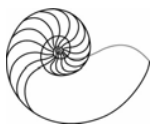
- ◆ What are the integrated models of care delivery for the frail elderly?
- ◆ What are the trends in Canada on care delivery compared to the international literature?



Health services for the frail (cont'd)

Research questions (cont'd)

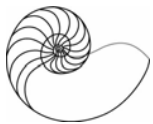
- ◆ Are there comparative outcomes for different models of care, and to what extent have such models been evaluated?
- ◆ What are the common characteristics of the identified models of care and what are the consistencies of such characteristics?



Health services for the frail (cont'd)

Question-specific keywords

- ◆ health services for the aged
- ◆ delivery of health care, integrated
- ◆ long term care
- ◆ comprehensive health care
- ◆ home care services
- ◆ managed care
- ◆ home care services
- ◆ home nursing
- ◆ homemaker services
- ◆ nursing homes
- ◆ homes for the aged
- ◆ intermediate care facilities
- ◆ skilled nursing facilities
- ◆ long term care
- ◆ continuity of patient care
- ◆ models, organizational
- ◆ preferred provider organizations



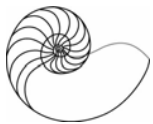
Health and social policy

Question leaders

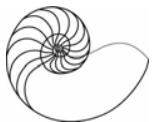
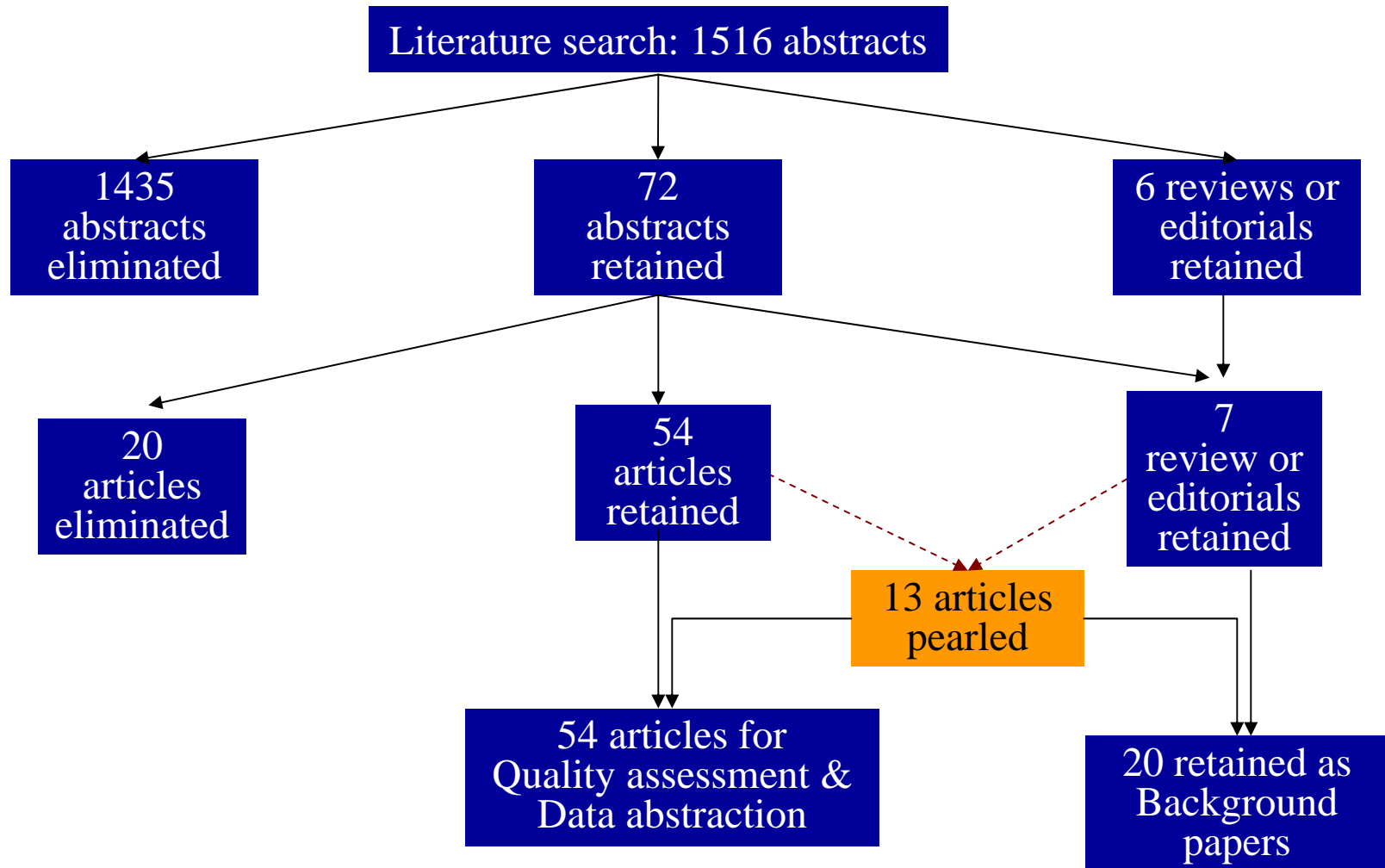
- ◆ Marcus Hollander (University of Victoria)
- ◆ Neena Chappell (University of Victoria)
- ◆ Michael Prince (University of Victoria)

Research questions

- ◆ What are the key policy issues in regard to care delivery and/or funding for the frail elderly?
- ◆ What are the issues, alternatives and recommended solutions?
- ◆ What are the broader "meta" issues, which may be reflected in the set of policy issues?
- ◆ What recommendations can be made to decision-makers?

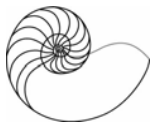


An example of the article selection process: Prevalence

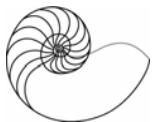


Quality Assessment Process

- ◆ Two assessors completed the quality assessment forms independently
- ◆ Assessors met to arrive at a consensus on the rating of each item as well as on the overall methodological quality of the article



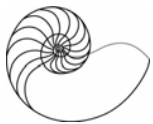
Quality Assessment and Data Abstraction Process



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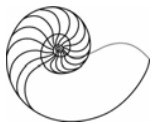
Quality Assessors

- ◆ Graduate students
- ◆ Not experts in content area
- ◆ Graduate level training in epidemiology and biostatistics
- ◆ Pre-tested using Fried (2001) article
- ◆ Full-day training on quality assessment and data abstraction



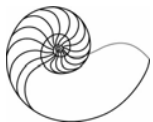
Quality Assessment Instrument

- ◆ Forms were developed for different study designs:
 - Cross-sectional
 - Longitudinal (observational)
 - Randomised Controlled Trials
- ◆ Contained 11-24 items
- ◆ Each item rated on a scale from 1-4
- ◆ Overall methodological quality
 - rated from 1-4
 - Subjective rating based on rating of individual items



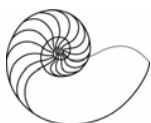
Data Abstraction Process

- ◆ Data abstraction forms were developed for different study designs
- ◆ Data abstraction form was completed by one of the quality assessors

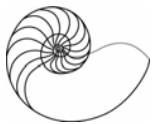


Quality Assessment Forms

| DATA ABSTRACTION | QUALITY CRITERIA SECTION 1: STUDY DESIGN | QUALITY ASSESSMENT | | | |
|--|---|--------------------|---|---|--------|
| | | ☹ 1 | 2 | 3 | ☺ 4 |
| Study Population: <i>Canadian, > 65yrs, including residents of Indian Reserves</i> | 1. Are the characteristics of the participants clearly described? | | | | X |



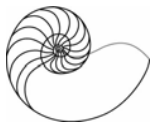
Outline for Final Reports



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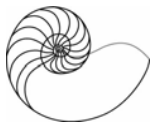
Background

- ◆ Important issues raised in the editorials and review papers that were selected
- ◆ Justification for conducting this review
- ◆ Question-specific research questions



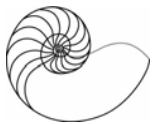
Methods

- ◆ Data sources for identifying the literature
- ◆ Definitions of frailty and related concepts
- ◆ Article selection process
- ◆ Data abstraction and quality assessment process
- ◆ Method of assessing the strength of evidence



Results

- ◆ Diagram with number of articles selected at each stage
- ◆ Description of the number of articles eliminated and reasons for elimination
- ◆ Table 1: Classification of articles according to their definition of frailty/related concepts
- ◆ Table 2: Description of studies included in the review
- ◆ Table 3: Synthesis of findings with the strength of evidence



Discussion

- ◆ Main findings
- ◆ Implications of findings
- ◆ Status of the literature: quantity and quality
- ◆ Methodological strengths and limitations of this review
- ◆ Future directions for research

