Women's Health & Sleep Research: Keys to Building a Research Career

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Essential Researcher Skills

Creating
- evidence for understanding phenomena

Managing
- resources (people, time, money)
- data

Marketing (selling)
- writing, presenting (proposals, results)

Mentoring/Consulting:
- hearing/giving/applying constructive criticism
Research Career: Keys Predisposing to Success

- doctoral degree (dissertation)
- postdoctoral study (expand methods &/or content)
- pre-&/or postdoctoral fellowship &/or small grants
- publish & present – writing
- researcher position: continual learning - ‘how the game is played’
Shaver Research Career Predisposing Keys

- dissertation - YES - basic science (kidney physiology)
- postdoctoral study - NO
- pre/postdoc fellowship grant or small grant - NO
- publish & present - dissertation - Yes
  


- researcher position: continual learning – YES – U. of Calgary (Canada), U of Washington (Seattle, USA)
Research Colleagues & Mentors

Nancy Woods

Elizabeth ‘Betty’ Giblin

Carol Landis

Margaret ‘Peg” Heitkemper

JS on Faculty ‘81-‘96

Martha ‘Marty’ Lentz
Study Proposal

Conduct Study

Present & Publish

Market & Mentor

Create & Market

Attain Funding

Profile Evidence

Collect Evidence

SKILLS

Build on Evidence

Manage
Research Success
Precipitating Keys:

• knowledge scan - gap analysis – ? fill gap
• preliminary data – literature, pilot/feasibility studies, pre-postdoctoral work

✓ Think long-range: predict outcomes & next steps
  if this result, then ... or if not, then ...

✓ Goal - series of studies (program of research)
Shaver & Team Research
Precipitating Keys:

- knowledge scan - gap analysis - YES

- preliminary data - YES
  Biomedical Research Support Grant, School of Nursing, U of Washington. "Insomnia Assessment: Perimenopausal Women" (Shaver PI) ($5,000)

- Think long-range - NO
Dialogue: Ideas about knowledge scans/gap analysis skills/processes?
Gap Analysis

- outline framework (beliefs, known) – read to corroborate – read to expand/change framework & judge ‘weight of evidence’
- evidence? – for, against, equivocal, missing
- categorize, create taxonomy – some way compare & contrast - ‘add up’
Shaver Knowledge Scan: Sleep in Midlife Women

• Surveys - 23 - 63% of post-menopausal women report insomnia (insufficient or poor quality sleep)

• comparing peri- or post- to pre-menopausal - 2x more report poor sleep (20% - 40%)

❖ with aging – know that sleep becomes less consolidated with more waking
Shaver – Gap Analysis

- Very few studies of midlife, menopausal (MP) status & sleep
- Almost all – descriptive surveys for prevalence
  measured only self-reported sleep
- Sample selection bias – many from physician practices or clinics
- Prevalence range wide & no clear evidence or investigation that MP contributed to reported poor sleep (insomnia) in midlife
Shaver & team: Create Evidence (for or against)

transition through menopause (time of ovarian hormone shifts)

associated with sleep disturbances (insomnia)? (self-report & physical measures)
1. **Introduction** – overview of ‘story’ while pointing to **innovation, impact, relevance, significance** of proposed aims

2. **Specific Aims** – key to whole proposal

3. **Background** – expansion - ‘**criticality**’ of proposed study

4. **Preliminary Studies** – **results/developed expertise** critical to support proposed work

5. **Methods** – design, sample, measures, protocol, data analysis

6. **Appendices**
Introduction – Précis of Proposal, Rationale for & Specification of Aims

• The Hook  (attracting attention, inspiring interest)

• Summarize Relevant Science Gaps  (analytically)

• Specify Aims  (close gaps)
Dialogue: What are ways of ‘hooking’ the reviewer?
• striking statistics
  – prevalence/incidence, economic impact, e.g.,
  An estimated __ Americans are obese, estimated to contribute to more than $__ billion a year in health care costs.

  – dire consequences, e.g.,
  In addition, every year, ___ million Americans die from obesity-related diseases, i.e., one death every ___ seconds.

• rarely or never studied, e.g.,
Emerging evidence points to a striking influence on health behaviors such as quitting smoking (refs) but no prior studies were found addressed to genotype influence in eating behaviors.
Introduction: After the hook

- Context & Gap analysis (summary story)
  - Convey what will close gaps

- Serves as rationale for aims
  - not known/has not been done/done poorly
  - your novel approaches/additions
  - what is to be gained (new knowledge, new measures, next steps)
More powerful to write analytically rather than descriptively

Dialogue: what is analytical (vs. descriptive) writing?
Analytical writing - Examples

• Compare across populations, features, etc.
  E.g., The weight of current evidence is suggestive that perceived poor and non-restorative sleep is highly prevalent with the functional somatic syndromes of fibromyalgia; evident perhaps in fewer women with irritable bowel; and not well established with chronic pelvic pain.

• Explain/suggest why inconsistencies occur

  E.g., The inconsistencies across studies in part emanate from varied subject selection processes relative to their chronic conditions and non-comparable selection of sleep indicators by which to judge poor or non-restorative sleep.
Analytical Writing

• Summarize weight of evidence and/or why variability across studies, e.g.,

Six studies showed a relationship of pain to sleep and four did not, perhaps due to more sample heterogeneity than has been addressed - including for stage/severity of the syndrome, extent of emotional arousal, inherent sleep quality, or stress reactivity.

• Make clear how your study will resolve issues – e.g., more homogeneous sample or analyze for hetero; measure wider range of contributing factors, e.g.,

E.g., We are proposing a study by which to compare sleep across women with painful functional somatic syndrome by sub-classifying women according to ..., thereby more comprehensively revealing the links between sleep and pain.
Of the more that 51 million midlife women transitioning through menopause, self-reported prevalence data indicate that as many as 50-60% have poor sleep (insomnia).

Knowing that poor sleep is associated with (dire consequences) ... large numbers (≈ 25+ mil) of women are vulnerable to poor health that could be prevented.
Introduction - Aims

- Aims - playbook
  - for closing the gaps
  - key to whole proposal

- Format – as declarative statements, questions, or hypotheses

- (Spend much time crafting!)
Introduction - Aims

• Aims should reveal:
  ✓ Variables of interest - VOI (label well & use consistently)
  ✓ How VOI are measured
  ✓ Relationships to be tested or concepts of interest to be derived, described, explained
Shaver – Menopause & Sleep Aims

• To determine the proportion of community-living midlife women (20-55 yrs. old) reporting poor sleep (insomnia)

• In midlife women classed as in pre-, peri, & post-menopause, determine differences in sleep patterns as measured by physiological & perceived sleep quality (PSG & single item rating).
Background – analytical expansion

• **Section headings** – match aims

• **Expand on gap analysis** – what we do & do not know & why (content & methods shortcomings)
  
  – Few studies, limited populations, conceptual/theoretical deficits, outcome deficits, measures deficits, design flaws
  
  – Weave in how your study will address shortcomings & what impact it will have
What makes paragraphs (convey dominant idea/message) easily comprehensible?
The Parts of a Paragraph

1. **Claim statement:** make overarching ‘critical’ claim related to storyline & aims

2. **Critical evidence**
   a) what we do & do not know & why (stay on topic)
   b) what it might/does or might not/does not mean
   c) evidence – for/against/equivocal or not determined

3. **Conclusion:** Your stand! So What!
   E.g., The weight of the evidence supports our intentions to...
   E.g., The dearth of (limited) evidence points to the need for...
   E.g., Therefore, we have designed our study to ...
   E.g., Thus, one can infer ... or  What is needed is ...
Shaver & Team Proposal
Funding

- 1987-90 Center for Nursing Research, National Institutes of Health, Bethesda, MD

- "A Nursing Study of Perimenopause Insomnia" (Shaver, PI)
Perimenopause Insomnia Study

- **Selected:**
  - healthy community-living (N=82)
  - for age (40-55 yrs) regardless of sleep & menopause Sx

- **Measured**
  - sleep – self-report & polysomnography (PSG)
  - emotional distress (SCL-90R)
  - menopausal Sx (vasomotor sx)
  - somatic Sx
Self-Report and Somnographic Sleep Quality Indicators

- Self-rated *usual sleep*
  
  “very good”, “good” or “fair” = Good
  “poor” or “very poor” = Poor

- Calculated sleep efficiency (PSG)

  \[
  \text{High SE} \geq 85\% = \text{Good} \\
  \text{Low SE} < 85\% = \text{Poor}
  \]
## Sleep Subtypes (N = 82)

<table>
<thead>
<tr>
<th>SE = sleep efficiency (polysomnography = PSG)</th>
<th>Reported Good Sleep (No insomnia)</th>
<th>Reported Poor Sleep (Insomnia)</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Recorded Good Sleep</strong></td>
<td>57.3% (n = 47)</td>
<td>14.6% (n = 12)</td>
<td>59 (72%)</td>
</tr>
<tr>
<td>SE ≥ 85%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Recorded Poor Sleep</strong></td>
<td>19.5% (n = 16)</td>
<td>8.5% (n = 7)</td>
<td>23 (28%)</td>
</tr>
<tr>
<td>SE &lt; 85% (insomnia)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Total = 63 (77%)  
Total = 19 (23%)
Peri-menopause Status Determination (N = 76)

- **Premenopause:** (n = 20)
  - regular menstrual cycles (MC), no hot flashes (sx), normal FSH

- **Perimenopause:** (n = 32)
  - Irregular MC, hot flashes, normal/high FSH

- **Postmenopause:** (n = 24)
  - > 2 years since LMP
No sleep indicators were different across menopausal groups
Menopausal Hot Flash Symptoms (sx)

- night sweats
- daytime hot spells
- daytime sweats
PSG Sleep Efficiency With & Without Hot Flash Symptoms (Sx)
N = 76

HF Sx = 2 or more HF within 2 days of lab sleep
Conclusions - phase 1

• a subset of midlife women report poor sleep (23%)

• more women with insomnia than have detectable poor physical (PSG) sleep

• insomnia influenced by hot flashes
Psychological Distress: Symptom Checklist-90R (SCL-90R)

- 3 global scales
- 9 Subscales:
  - somatization
  - anxiety
  - depression
  - obsessive-compulsive
Psychological distress in sleep subtypes (ANOVA P<0.04) SCL-90R

**Insomnia** (perceived poor sleep) vs. **No Insomnia**

* = significant difference

- **Poor PSG Sleep**
- **Good PSG Sleep**
- **Good PSG Sleep**
Somatic Symptoms

- headache, backache, joint pain, diarrhea,
- tingling, heart racing, dizziness
- tiredness, cough, shortness of breath
Somatic & Menopausal Sx in Sleep Subtypes

ANOVA < p 0.01

**Insomnia** (perceived poor sleep) vs. **No Insomnia**

<table>
<thead>
<tr>
<th>Poor PSG SE</th>
<th>Good PSG SE</th>
<th>Good PSG SE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Somatic Sx</td>
<td>Menopausal Sx</td>
<td>Somatic Sx</td>
</tr>
</tbody>
</table>

Bar chart showing differences in PSG sleep efficiency (SE) across subtypes with or without insomnia.
Conclusions Phase 2:

2 Patterns **Insomnia** – perceived poor sleep

+ poor PSG Sleep
  - predominant menopausal symptoms

+ good PSG Sleep
  - predominant psychological distress & general somatic symptoms
  - high life strain
Summary Conclusions

- natural ovarian hormone fluctuations disrupt sleep in some women

- two patterns of **insomnia**
  - Type 1 – perceived poor & recorded poor
    - dominant menopausal Sx
    - ? Treat hot flashes to improve sleep
  - Type 2 – perceived poor & recorded good
    - dominant emotional distress/life strain
    - ? Treat stress activation to improve sleep

Sleep, 14(1), 2001
Digilogue: How important is it to Formulate/Work From a Framework?

Advantages?
**Human Health Ecology Framework**

Person Factors
- Vulnerability/Resilience

Environmental Factors
- Risks/Resources
  - E.g. Social support
  - Noise, Light
  - Food availability
  - Microorganisms

**Person Factors**
- E.g. Age
- Genetics
- Gender

**Environmental Factors**
- E.g., Knowledge
- Attitudes, Traits
- Health-related Behaviors

**Health/Illness Phenomenon**

**E.g., Symptoms**: Pain, Fatigue, Insomnia, PTSD

**Diseases**: Diabetes, CVD, Cancer, Major Depression, Fibromyalgia

**Conditions/Context**: Wound Healing, Preventing Bedsores, Caregiver Stress, Menopause Transition
Nursing Therapeutics
being with/participatory
assess/diagnose - monitor/surveillance
intervene/coordinate

Person Factors
Vulnerability/Resilience

Environmental Factors
Risks/Resources

Health/Illness Phenomenon
Sleep Regulation

Timing/Rhythm Component
(Light/dark-hormone Response e.g., Melatonin)

Sleep Drive Component
(Balance of Neurochemicals e.g., Adenosine)

Circadian

Facilitators/Inhibitors
(Environment, Behaviors)

Sleep disturbance/reinforcement

Homeostatic
Health Ecology Framework - Sleep Quality

Person
- Sleep Drive
  ✓ Cognitive-Emotional Arousal
  ✓ Physiological Activation
- Circadian Timed Hormones
- Sleep-related Behaviors

Environment
- Light/Dark Cycles
- Sensory Inputs
- Social Patterns
- Behavioral Cues

Activator-Inhibitor Control

Episodic or Enduring

Sleep Quality (Insomnia)

Stress Episodic or Enduring

Sleep out of synchrony with light/dark cycle = poor sleep
Low/normal drive – normal/high stress arousal/activation = poor sleep
Behaviors conditioned negative to sleep = poor sleep
Therapeutic Considerations for Preventing or Treating Insomnia

Sleep out of synchrony with light/dark cycle = poor sleep
Low/normal drive – normal/high stress arousal/activation = poor sleep
Behaviors conditioned to or environment negative to sleep = poor sleep
Building on Evidence

- Evidence of substantial prevalence of insomnia in midlife 🧑
- No evidence of MP hormonal changes being prominent
- Evidence of stress emot. arousal & likely stress physiological activation play a role

- Chose to pursue stress and insomnia
Study Proposal

- Conduct Study
  - Collect Evidence
  - Manage
    - Profile Evidence
    - Market & Mentor
  - Present & Publish
    - Build on Evidence
- Create & Market
  - Attain Funding
Funding for Building

1. 1987-90  Center for Nursing Research, National Institutes of Health, Bethesda, MD, "A Nursing Study of Perimenopause Insomnia"

2. 1989-94  Center for Women's Health, NIH, "Symptoms and Stress Responsivity in Midlife Women". (Shaver - Co-director & PI)

3. 1992-96  Center for Nursing Research, NIH, "A Nursing Study of Perimenopause Insomnia" (continuation) (Shaver - PI)

Closing Reflections – my good fortune to work closely with many STTI Researcher Hall of Fame Nurse Colleagues

Dr. Nancy Woods
Dr. Margaret Heitkemper
Dr. Pamela Mitchell
Dr. Ruth McCorkle
Now - Yale
STTI Researcher Hall of Fame Nurse Colleagues

Dr. JoEllen Wilbur
Now - Rush U.

Dr. Carol Ferrans
Assoc. Dean  UIC

Dr. Nina Peragallo
Dean – U. of Miami

Dr. Usha Menon
Now – Vice Dean
Ohio State U.
STTI Researcher Hall of Fame
Nurse Colleague

Dr. Ki Moore
Division & Academic Programs Director
Shaver: Research Mentorship Phases

- Have had the good fortune of working with many pre & post-PhD scholars – students/faculty – who excelled, e.g.,

Dr. Kathryn Lee
UCSF
STTI INR Hall of Fame

Dr. Cynthia Dougherty
U of Wash
STTI INR Hall of Fame

Dr. Mary Kapella
U. Of Illinois at Chicago (UIC)
Mentorship Continues ...

At the University of Arizona .. E.g.,

Dr. Sheila Gephart
UA

Dr. Jane Carrington
UA

Dr. Tad Pace
UA

How lucky am I!
The reason you can’t fool all of the people all of the time, is because half of the people are women.