Title Slide: Multilevel Interventions: Measurement and Measures

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Slide 2: Context

- The “call to action”
- Multilevel intervention research requires multilevel theory, design, measures
- Measurement and analysis approach flows from
    - Intervention objectives
    - Theoretical model

Slide 3: Objective

- Provide practical guidance on measurement issues in multilevel intervention research in order to advance the state of the science in this area
    - Identify gaps in the literature
    - Recommend how to address those gaps

Slide 4: Socio-Ecological Model

Because we’ve asserted above that the measurement approach used in a study should flow in part from the theoretical model, we will begin with a few details about the theoretical model guiding our work.

The Socio-ecological model used as a common framework for the papers assembled for this supplement acknowledges that health outcomes result from complex relationships between the characteristics of patients, families, care teams, practice settings, community environments, and both state and national health policy environments.
Description of example measures at each/some levels?
Developing and evaluating interventions that attempt to manipulate and measure the complex interplay between three or more of these various levels, (which is how this group of papers has defined “multilevel intervention”), is complex work.
The complexity of multilevel intervention research is magnified in a decentralized healthcare system such as the United States’, where many individuals receive care from multiple health care organizations, each with different local policies, resources, practice standards, and cultural norms.
Perhaps in part due to this complexity, there is a striking paucity of research evaluating interventions targeting more than one level across the cancer care continuum.
Further, even the few prior studies that have evaluated multilevel interventions have not all employed multilevel measurement approaches.
Given the dearth of prior research on multilevel interventions generally, and the use of multilevel measures specifically, our paper focuses more on what should be than has been done in this area.

[image]

Figure 1: Multilevel Influence of the Cancer Care Continuum

Shows an ellipse with 7 concentric ellipses inside it. All the ellipses come together at the bottom to out a different section. Starting from the outermost ellipse to inner most, the sections are as follows:

- National Health Policy Environment
- State Health Policy Environment
- Local Community Environment
- Organization and/or Practice Setting
- Provider/Team
- Family & Social Supports
- Individual Patients

Individual Patients go Improve Quality of Cancer Care and then to Improved Cancer-Related Health Outcomes.

[End image]

The following is a breakdown of each section:

- National Health Policy:
    - Medicare reimbursements
    - Federal efforts to reform healthcare
    - National cancer initiatives
    - Accreditations

    - Professional Standards
- State Health Policy:
    - Medical reimbursements
    - Hospital performance data policies (dissemination, visibility, etc.)
    - State cancer plans/programs
    - Regulations/limitations on reimbursements of clinical trials
    - Visibility of state-wide advocacy groups
- Local Community:
- Organization/Practice setting:
    - Leadership
    - Organizational structure. policies and incentives
    - Delivery system design
    - Clinical decision support
    - Clinical information systems
    - Patient education and navigation
- Provider/Team
- Family/Social Supports
- Individual/Patient

Slide 5: Systems Approach To Interventions

Possible visual to use when explaining different types of models (homologous vs. cross-level, vs. single level)

[image]

There are four Ven diagrams in the middle of the image. Each Ven diagram is the same consisting of four ellipses that intersect each other in the middle, The four ellipses are named 'Processes', 'Outcomes, 'Emergent States' and 'Context'. The diagram also shows an arrow coming out where 'Outcomes' and 'Emergent States' meet. The arrow goes around the diagram and into where 'Processes' and 'Context' meet.

At the top of the image is a bar called "Intervention Targets". Under the bar are four sections, 'Individual', 'Group', 'Organization' and 'Inter-Organization'. Each section goes to one of the Ven diagrams where 'Processes' and 'Outcomes' meet.

On the bottom of image is a bar called "Units of Measurement". Over the bar are four sections, 'Individual', 'Group', 'Organization' and 'Inter-Organization'. Each section goes to one of the Ven diagrams where 'Context' and 'Emergent States' meet.

[End image]

Slide 6: Measures

One of the things that is important to appreciate and understand in conducting multilevel intervention research is the fact that there can be multiple levels of interventions (in terms of targets) as well as measures (in terms of outcomes, mediators, moderators, and confounders). The vast majority of prior cancer care interventions target the single level of the patient and only include measures at that same level. A few target a single intervention level but include measures at multiple levels, and some target multiple levels but only examine measures at a single level. However, very few include both multilevel intervention targets and measures. This table illustrates some of these distinctions, using screening promotion as a hypothetical example.

An example of a single level screening promotion intervention based on single level measures would be a patient directed reminder intervention implemented in a single practice setting examining screening adherence as the dependent variable and patient demographics, attitudes, and behaviors (such as scheduling an appointment for a screening procedure) as independent measures.

If this same study design was modified so that the intervention was implemented in multiple practice settings and measures of practice setting characteristics (such as baseline screening rates and organizational complexity) were added as stratifying variables or confounders, this would be a single level intervention study using multilevel measures.

If you changed the intervention to target multiple levels by adding a provider education piece and a clinical reminder, but only examined patient level outcomes and independent measures, this would be a multilevel intervention with single level measures.

The most complex design would be a multilevel intervention with multilevel measures that explored the associations within and across levels. For example, in addition to an intervention targeting the patient, provider, and organizational level, you could have dependent and independent measures at the patient, provider, and organizational level, and explore the extent to which the intervention effect on patient and provider behaviors varied across practice characteristics such as baseline screening rates and organizational complexity.

Table 1: Measures

Intervention	Measures	
	Single Level	Multilevel
Single Level	Intervention: • Patient level: Patient reminder implemented in a single practice setting	Intervention: • Patient Level: Patient reminder implemented in multiple practice settings
	Measures: • Dependent: Patient screening adherence • Independent: Patient Level: Demographics (confounder), attitudes (modifier), and behaviors (mediator)	Measures: • Dependent: Patient screening adherence • Independent: o Patient Level: Demographics (confounder), attitudes (modifier), and behaviors (mediator) o Practice level (confounders/modifiers): Baseline screening rates, facility complexity
Multilevel	Intervention: • Patient level: Patient reminder • Provide level: Provider education • Practice level: Clinical reminder	Intervention: • Patient level: Patient reminder • Provide level: Provider education • Practice level: Clinical reminder
	Measures • Dependent: Patient screening adherence • Independent: Patient Level: Demographics (confounder), attitudes (modifier), and behaviors (mediator)	Measures • Dependent: o Patient level: Patient screening adherence o Provider level: Tests ordered/referrals made • Independent: o Patient Level: Demographics (confounder), attitudes (modifier), and behaviors (mediator) o Provider level (mediator/modifier): knowledge, attitudes o Practice level (confounder/modifiers): Baseline screening rates, practice characteristics

Slide 7: Articles Reviewed

[image]

Showing the number of articles reviewed and number of articles removed.

First Stage: 1,781 (reviewed), minus 137 duplicates, conference papers, and letters/editorials/comments/errata
Second Stage: 1,644 articles left

- minus 449 biomedical effects/treatments/techniques
- minus 123 not related to cancer care

Final Stage: 1,072 articles related to cancer care interventions, measures

[End image]

Slide 8: Level by Type of Care

[image]

Bar graph showing "Level by Type of Care"

Single Level:

- Risk Assessment: 60
- Prevention: 17
- Detection: 146
- Diagnosis: 24
- Treatment: 382
- Survivorship: 329
- End of Life: 29

Multilevel:

- Risk Assessment: 26
- Prevention: 11
- Detection: 67
- Diagnosis: 12
- Treatment: 65
- Survivorship: 52
- End of Life: 11

[End image]

Slide 9: Level by Intervention Target

[image]

Bar graph showing "Level by Intervention Target"
Single Level:

- Patient: 256
- Caregiver: 12
- Other Individual: 11
- Group: 6
- Organization: 2
- Community: 4
- Other: 0

Multilevel:

- Patient: 28
- Caregiver: 21
- Other Individual: 5
- Group: 9
- Organization: 2
- Community: 2
- Other: 0

[End image]

Slide 10: Level by Unit of Measure

[image]

Bar graph showing "Level by Unit of Measure"

Single Level:

- Patient: 746
- Caregiver: 46
- Other Individual: 35
- Group: 8
- Organization: 6
- Community: 3
- Other: 16

Multilevel:

- Patient: 199
- Caregiver: 108

- Other Individual: 20
- Group: 15
- Organization: 45
- Community: 10
- Other: 95

[End image]

Slide 11: Recap

- Of 1,152 articles reviewed, fewer than 25% were multilevel (intervention studies, essays, review, models, qualitative, measures development, etc.)
- Of 356 intervention studies reviewed, fewer than 20% were multilevel
- The most common type of multilevel study:
    - Whether considering intervention target or unit of analysis
    - Involves patient and caregiver (both at the individual level of analysis)

Caution:
Don't mistake a multi-component intervention or multi-arm trial for a multilevel intervention
Don't mistake setting for an intervention target

Slide 12: Discussion

- More multilevel model investigation is needed, and structured literature reviews are an important tool
- Focus on existing measures and gaps to be filled in further research
- Focus on multilevel investigation offers opportunities to extend levels considered
- Importance of detailed and well-developed theory as a basis for careful analysis

Slide 13: Organizational Level Measures

- In health care systems, particular organizational level measures may be especially important in effectiveness, implementation and sustainability
    - Leadership, culture, quality, non-financial incentives are important examples
- Interactions across levels may be especially important in the continuum of cancer care to extend multilevel modeling beyond provider/patient interactions into organizations

Slide 14: Methods for Extending Studies Toward True Multilevel Analysis

- Team-level models: specifying global, shared, or configurations of team constructs or to other higher aggregations (e.g., networks or systems)
- Cross-level models: specifying how interventions (typically at higher levels) affect outcomes (e.g., at individual levels)
- Homologous multilevel models: specifying how relationships between interventions and outcomes might hold at multiple levels of analysis (e.g., for interventions at both provider and team levels)

Slide 15: Questions

- What are barriers to developing ML interventions and measures?
- Can ML models be used in the context of RCTs to address measurement issues?
- Can ML models be used with research designs other than RCTs to address measurement issues?
- What theoretical/conceptual frameworks are helpful for conceptualizing ML research and developing appropriate measures?
- What models/measures include focus on groups or organizations?
- What models/measures address interactions across levels?
- What models/measures address sustainability of interventions?