Use of Analytic Hierarchy Process to elicit stakeholder preferences for prioritizing research

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Jerry A. Krishnan, MD, PhD (jakris@uic.edu)
Professor of Medicine and Public Health
Associate Vice President for Population Health Sciences

on behalf of the CONCERT Investigators

Outline

1. Chronic obstructive pulmonary disease (COPD) as a key health condition.
2. Rating importance and simple ranks to establish priorities.
3. Analytic hierarchy process to establish priorities.

Chronic Obstructive Pulmonary Disease (COPD)

• Key health condition in US
  – Most common lung disorder
    • 24,000,000 persons
  – 3rd leading cause of death
    • Deaths rising
    • Heart disease, Cancer, COPD, CVA, Accidents
  – 3rd leading cause of hospital readmissions
  – $49.9 billion / yr

Picture: NHLBI Chartbook called Public Health Strategic Framework for CPOD Prevention

Chronic Obstructive Pulmonary Disease (COPD)

• Key health condition in US
• Model complex medical condition
  – Multiple co-morbid conditions
  – Multiple healthcare providers
  – Multiple healthcare settings

Pictures: A photograph of a man coughing, a photograph of a patient with a nurse and a photograph of an elderly patient.
Slide 5
“Setting effectiveness and translational research priorities to improve COPD care”

Year 1 (Importance, simple ranks)
- May 21-22, 2009
- Hard Rock Cafe
- San Diego, CA
- Chronic COPD care
- Care coordination in COPD

Year 2 (AHP)
- May 20-21, 2010
- New Orleans
- Acute COPD care
- Transitions in care in COPD

Slide 6
Who? What? When?

- Stakeholders
  - Patient advocacy groups
    - COPD foundation
  - Funders of health care
    - CMS, Wellpoint
  - Quality
    - Joint Commission, AHQA
  - Professional societies
    - ATS, ACP, ACCP, AARC, AACVPR,SHM,AASM, CAEM,ACEP, ASPH
  - Research funders
    - NHLBI, AHRQ, NINR

Slide 7
Who? What? When?

- Phases of stakeholder engagement (2 years)
- Pre-conference TCs
- Goals, procedures
- Elicit topics
- Provisional voting
- In person meeting
- Presentations by topic experts
- Discussion of provisional votes
- Final ranking
- Post-conference
• Review / comment on priorities
• Submit for peer review
• Improved Community Problem Solving

Slide 8
Importance (1 (most) to 9 (least))

<table>
<thead>
<tr>
<th>Topic</th>
<th>Median(IQR)</th>
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<tr>
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Slide 9
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</tbody>
</table>

• Several topics identified
• Preferences variable
• All topics important to someone
  – Simple rating of importance does not provide separation
  – Rationale (criteria) for rating unclear
Slide 10
Simple ranks

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Slide 11
Simple ranks

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• Several topics identified
  - Preferences variable
  - Simple ranks do not measure relative importance of topics
  - Rationale (criteria) for ranking unclear

Slide 12
MCDA methods: the Analytic Hierarchy Process

• Rating explicitly linked to criteria
• Normalized Priority: proportion of the total importance that is attributed to a particular decision alternative.

Picture: Flowchart of the analytic hierarchy process. The top object labeled Decision objective (treatment) is linked to objects below labeled Criterion 1, Criterion 2 and Criterion 3, each of which is linked to objects labeled Alternative 1 and Alternative 2.
MCDA methods: the Analytic Hierarchy Process

• Series of pairwise comparisons between alternatives (research topics) for each criterion

Picture: Flowchart of the analytic hierarchy process. The top object labeled Decision objective (research topic) is linked to objects labeled Criterion 1 (1/9 to 9x as important), Criterion 2 and Criterion 3. Beneath, there are four objects labeled Topic 1, Topic 2, Topic 3 and Topic 4.

MCDA methods: the Analytic Hierarchy Process

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Slide 19

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Slide 20

MCDA methods: the Analytic Hierarchy Process

• 6 pairwise comparisons for 4 alternatives (topics) for 1 criterion.

Picture: Flowchart of the analytic hierarchy process. The top object labeled Decision objective (research topic) is linked to objects labeled Criterion 1 (1/9 to 9x as important), Criterion 2 and Criterion 3. Beneath, there are four objects, labeled Topic 1, Topic 2, Topic 3 and Topic 4. Each object labeled with a Criterion is linked to Topic 1, Topic 2, Topic 3 and Topic 4.

Slide 21

MCDA methods: the Analytic Hierarchy Process

• 18 pairwise comparisons for 4 alternatives (topics) for 3 criteria. What about more topics, and more criteria?

Picture: Flowchart of the analytic hierarchy process. The top object labeled Decision objective (research topic) is linked to objects labeled Criterion 1 (1/9 to 9x as important) through Criterion 7. Beneath, there are 9 objects, labeled 1 through 9. Each object labeled with a Criterion is linked to each numbered object.

Slide 22

Criteria used by stakeholders

1. Uncertainty about effectiveness
2. Impact on patient centered outcomes in efficacy studies
3. Quality of evidence in efficacy studies
4. Variability in care in real world settings
5. Societal cost
6. Feasibility of effectiveness studies
7. Results would inform care in diverse settings

**Slide 23**
*MCDA methods: the Analytic Hierarchy Process*

Picture: Flowchart of the analytic hierarchy process. The top object labeled Decision objective (research topic) is linked to objects labeled Criterion 1 through Criterion 7. Beneath, there are 9 objects, labeled 1 through 9. Each object labeled with a Criterion is linked to each numbered object.

**Slide 24**
*MCDA methods: the Analytic Hierarchy Process*

Box overlay of the previous flowchart from slide 23:
- For each criterion, there would be \(\frac{n(n - 1)}{2}\) pairwise comparisons, where \(n\) is the number of research topics being compared or 9 topics, \(9(9-1) / 2 = 36\) comparisons; for 9 topics, 7 criteria, \(7 \times 36 = 252\) comparisons

**Slide 25**
*Modified AHP, to triage topics: 1/9 to 9x as overall important*

<table>
<thead>
<tr>
<th>Topic</th>
<th>1</th>
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Slide 26
Modified AHP, to triage topics: 1/9 to 9x as overall important

<table>
<thead>
<tr>
<th>Topic</th>
<th>Normalized priority</th>
<th>IQR</th>
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<td>0.01 – 0.04</td>
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Slide 27
Reflections on AHP for setting CER priorities
1. Quantifies relative priorities and can be used to link voting patterns to criteria
2. Not practical when 'large' # topics, criteria
   - 9 topics, 7 criteria → 252 comparisons
   - 5 topics, 5 criteria → 50 comparisons
   - 3 topics, 3 criteria → 9 comparisons
3. CONCERT’s experience
   - Use pragmatic version of AHP (or other approach) to triage topics and criteria
   - Fully deploy AHP on highest scoring topics and most important criteria
   - Given variation in preferences, collaborate with different sets of stakeholders on separate CER topics

Slide 28
Acknowledgements

David Au - UW/VA
Shannon Carson - UNC
Jerry Krishnan, Todd Lee - UIC
Ted Naureckas - U of C
Peter Lindenauer - Baystate / Tufts
Mary Ann McBurnie - KPCHR / DCC
Richard Mularski - KPCHR

COPD
Outcomes-based
Network for Clinical Effectiveness and Research Translation

Picture: image of a map of the United States with the locations of the researchers’ institutions marked