Slide 1

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

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Slide 2

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.

Slide 3

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

Slide 4

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))

	Topic	Median(IQR)
1.	A	2 (1 – 3)
2.	B	3 (1 - 3)
3.	C	3 (1 - 4)
4.	D	3 (2 - 4)
5.	E	3 (2 - 4)
6.	F	3 (3 - 4)
7.	G	3 (4 – 9)
8.	H	3 (5 - 10)
9.	I	4 (3 - 5)

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

	Topic	Median(IQR)
1.	A	2 (1 - 3)
2.	B	3 (1 - 3)
3.	C	3 (1 - 4)
4.	D	3 (2 - 4)
5.	E	3 (2 - 4)
6.	F	3 (3 - 4)
7.	G	3 (4 - 9)
8.	H	3 (5 - 10)
9.	I	4 (3 - 5)

- 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

	Topic	Median(IQR)
1.	A	3 (2 – 5)
2.	B	3.5 (2 – 8)
3.	C	5 (4 – 8)
4.	D	6 (2 - 7)
5.	E	6 (3 – 8)
6.	F	6.5 (4 – 9)
7.	G	6.5 (5 – 10)
8.	H	7 (5 – 8)
9.	I	7 (6 – 8)

Slide 11
Simple ranks

	Topic	Median(IQR)
1.	A	3 (2 – 5)
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7.	G	6.5 (5 – 10)
8.	H	7 (5 – 8)
9.	I	7 (6 – 8)

- 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.

Courtesy of MJ IJzerman

Slide 13
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.

Slide 14
MCDA methods: the Analytic Hierarchy Process

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Slide 15
MCDA methods: the Analytic Hierarchy Process

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Slide 16
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Slide 17

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Slide 18

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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 [*n(n - 1)*]*/2*** pairwise comparisons, where *n* is the number of research topics being comparedor 9 topics, [9 (9-1)] / 2 = 36 comparisons; for 9 topics, 7 criteria, 7 X 36 = **252 comparisons**

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

Topic	*1*	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*
1	This box is filled in								
2	1/9	This box is filled in							
3	1/3		This box is filled in						
4	9			This box is filled in					
5	2				This box is filled in				
6	1/2					This box is filled in			
7	3						This box is filled in		
8	1/5							This box is filled in	
9	4								This box is filled in

Table

Slide 26
Modified AHP, to triage topics: 1/9 to 9x as overall important

Topic	Normalized priority	IQR
1		
2		0.1 – 0.4
3	0.17	0.1 – 0.2
4	0.14	0.06 – 0.15
5	0.12	0.04 – 0.19
6	0.07	0.03 – 0.08
7	0.04	0.02 – 0.05
8	0.02	0.01 – 0.04
9	0.02	0.01 – 0.04

Table

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
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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