Instrument Development for Continuing Medical Education (CME) Evaluation

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Current Status

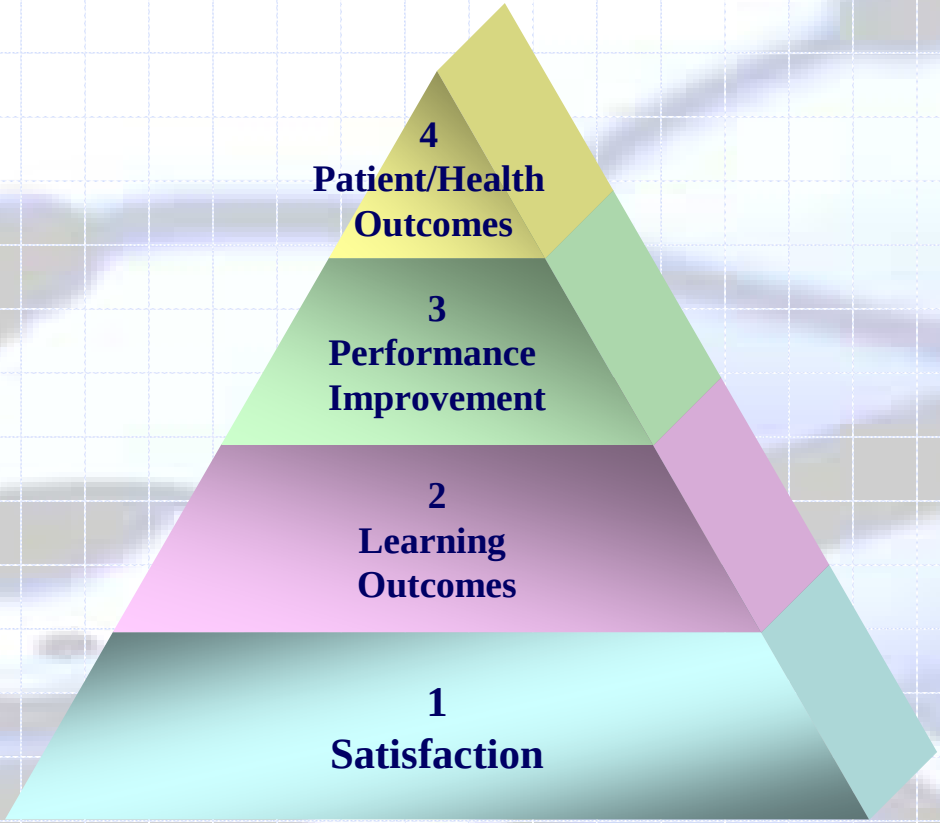
- Forty-seven of fifty-four state and territorial medical licensing boards require completion of 12 to 50 hours of CME per year for license re-registration.

- CME activities are underpinned by a belief that gains in knowledge lead physicians to improve how they practice and thus improve patient outcomes.

Current Status

- Evaluation of the effects of CME has been less common and more often have assessed physicians' satisfaction about lectures and sometimes changes in physicians' medical knowledge and attitudes.
- Physicians' behavioral changes are less often evaluated.

Modified Kirkpatrick's Model for CME



Developed by Donald Kirkpatrick (1994), modified by Curran and Fleet (2005)

Levels of Evaluations (Tian et al., 2007)

Evaluation Level	RCT		NRCT	
	N	(%)	N	(%)
2	4	12.5	35	46.7
3	10	31.3	20	26.7
4	7	21.9	2	2.7
2/3	5	15.6	16	21.3
3/4	4	12.5	1	1.3
2/3/4	2	6.3	1	1.3
Total	32	100	75	100

Research Issues (Tian, et al., 2007)

- Insufficient sample size
- Unclearly defined target audience
- Selection bias
- Research design issues
  - Unit of randomization do not match unit of analysis—RCT
  - No comparison group—NRCT
- Lack of instruments' validity and reliability information

Recommendations (Tian et al., 2007)

- Gold standard of CME evaluation --- four components:
  - Participants' satisfaction (level 1)
  - Participants' knowledge, attitudes and skill changes after the intervention (level 2)
  - Participants' performance changes in clinical setting supported by objectively observed data (level 3)
  - Patient's health status changes supported by measurable medical indexes. (level 4)
- Use valid and reliable instruments in level 2 evaluation
  - A standard questionnaire with core items on attitudes/self-efficacy/beliefs that modifiable for different CME programs for the purpose of evaluation and comparison should be developed.

Purpose of the Study

- To create a theoretically driven, valid, reliable, and adaptable CME evaluation instrument addressing attitudinal determinants of physician behavior change, i.e. attitudes, beliefs, subjective norms, perceived behavioral control (self-efficacy) and behavioral intention.

Methodology

- Phase I. Scale Development
- Phase II. Scale Validation
- Phase III. Data Collection and Analysis

Phase I.II Scale Development & Validation

- Develop Template (Theory of Planned Behavior)

- Determine Format for Measurement (7-point Semantic Differential Scale)
- Expert Feedback
  - UM Faculty Members
  - CME Experts
  - Meeting Organizers

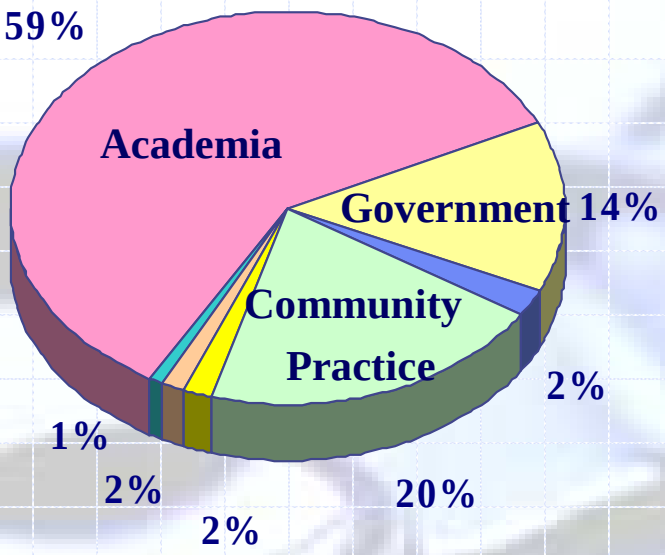
Phase I.II Scale Development & Validation

- Modify Template
  - Meeting Purpose and Educational Objectives of the NCI Conference
- Examine Content Validity
  - Expert Review Initial Item Pool
  - Cognitive Testing (p.73-74)
  - Expert Review
  - Pilot Test
- Instrument Finalization

Phase III. Data Collection-Sample

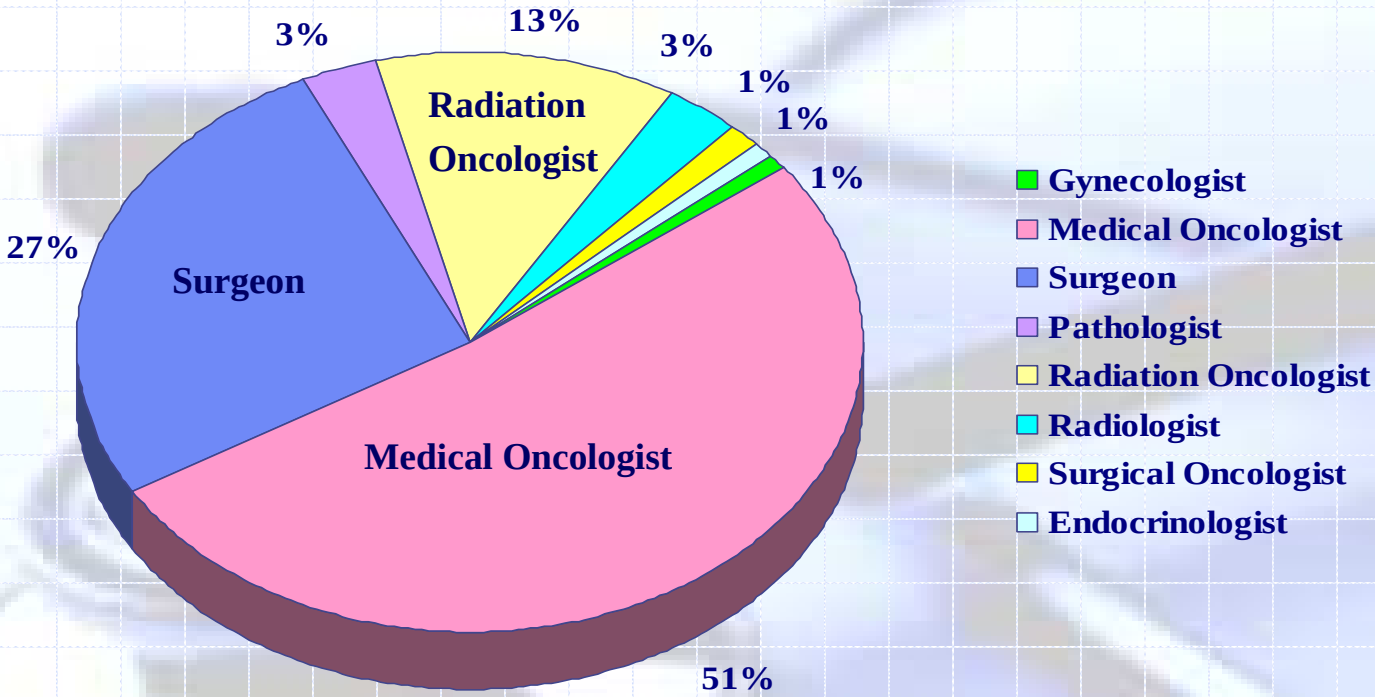
- Target audiences: breast cancer physicians (medical oncologists, radiation oncologists, radiologists, pathologists, surgeons, and others).
- 431 participants registered
- 269 on-site participants
- 164 participants responded
- 134 physician participants
- Response rate: 61%
- Participant**:** item ratio = 6:1

Phase III. Data Collection- Sample



Affiliation

Phase III. Data Collection- Sample



Specialty

Phase III. Data Collection- Sample

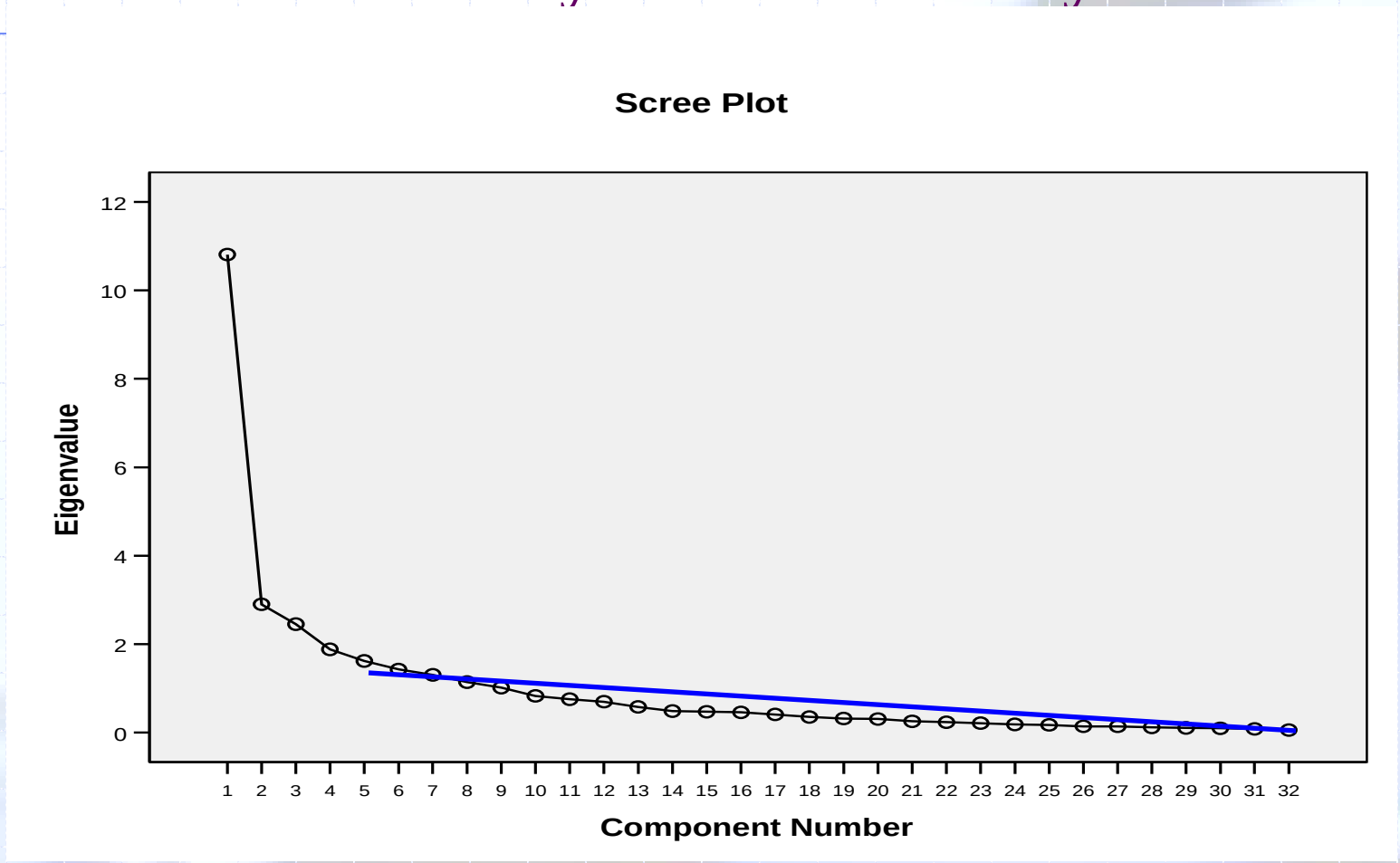
Seeking CME Credits		
	Frequency	Percent
Do not seek CME credits	26	19.7
Seek CME credits	106	80.3
Total	132	100.0
Gender		
Male	62	47.0
Female	70	53.0
Total	132	100.0

Phase III. Data Analyses- Factor Analysis

Factor	Eigenvalues	Percent of Variance	Cumulative Percent
1	10.810	33.781	33.781
2	2.900	9.061	42.842
3	2.451	7.661	50.502
4	1.880	5.874	56.376
5	1.618	5.057	61.433
6	1.426	4.456	65.890

Extraction Method: Principal Component Analysis

Phase III. Data Analyses- Factor Analysis



Extraction Method: Principal Component Analysis

Phase III. Data Analyses- Factor Analysis

Factor	1	2	3	4	5	6
1	1.000	-.170	-.361	-.022	-.284	-.470
2	-.170	1.000	.074	-.026	-.048	-.057
3	-.361	.074	1.000	.031	.154	.417
4	-.022	-.026	.031	1.000	-.071	-.050
5	-.284	-.048	.154	-.071	1.000	.380
6	-.470	-.057	.417	-.050	.380	1.000

Extraction Method: Principal Component Analysis

Phase III. Data Analyses- Factor Analysis

Factor	# Items in Scale	Factor Name	Eigenvalues	Percent of Variance	Cumulative Percent
1	7	Perceived Behavioral Control	10.610	33.157	33.157
2	3	Positive Beliefs	2.601	8.128	41.285
3	5	Attitudes	2.122	6.630	47.915
4	2	Negative Beliefs	1.380	4.312	52.227
5	3	Behavioral Intention	1.204	3.763	55.990
6	4	Subjective Norms	1.083	3.384	59.374

Extraction Method:

Principal Axis Factoring (PAF) with Oblimin Rotation

Phase III. Data Analyses- Item Analyses

Factor	# Items in Scale	Factor Name	Alpha	Standardized Item Alpha
1	7	Perceived Behavioral Control	0.937	0.938
2	2	Positive Beliefs	0.759	0.759
4	2	Negative Beliefs	0.739	0.739
3	5	Attitudes	0.898	0.898
5	2	Behavioral Intention	0.882	0.883
6	4	Subjective Norms	0.906	0.909

Final Instrument

Instrument Development Protocol

- Template Modification
- Cognitive Testing
- Expert Review
- Survey Revision
- Pilot Test

Limitations

1. Small Sample Size
2. Selection Bias
3. Small Item : Construct Ratio
4. Self-reported Data
5. Topic Specific Survey

Conclusions

1. A thorough content validation process (cognitive testing, expert review, pilot testing) provided the evidence for content validity.
2. A psychometric examination of the draft instrument revealed unexpected measurement subscales (positive/negative belief scales).
3. The subscales were consistent with the pre-determined theoretical domains.
4. The subscales of the instrument demonstrated acceptable reliability evidenced by item analyses.
5. A thorough instrument development process resulted in an instrument that may be appropriate for evaluation of current CME.

Recommendations for Future Research

1. Increase Sample Size.
2. Add two more items to positive/negative belief and intention subscales and validate.
3. Using internet-based gate keeping instrument.
    1. Increase sample size
    2. Conduct convergent/discriminant validity analyses.
4. Theory Testing Analyses with Structural Equation Modeling.
5. Apply the instrument to other CME activities.
6. Evaluate CME effectiveness though pre/post, follow up research design.

Thank You

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Discussion

- How could the developed instrument be disseminated in the CME field?
- Are there other patient-related outcomes that are important to clinicians who are learning a new practice?
- What kind of assistance would CME providers need to use this type of instrument?
- Do you have any populations or opportunities to definitively test the preliminary findings of this study?

Regression results

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	95% Confidence Interval for B	
		B	Std. Error	Beta			Lower Bound	Upper Bound
1	(Constant)	3.054	1.539		1.985	.049	.008	6.101
	ATTITUTE	.038	.051	.074	.733	.465	-.064	.139
	SUBNORMS	.209	.070	.317	2.974	.004	.070	.348
	SELFEFFI	.038	.043	.091	.893	.374	-.046	.122

a. Dependent Variable: INTENT

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
INTENT	Equal variances assumed	.	.	.675	126	.501	2.17323	3.21997	-4.19900	8.54546
	Equal variances not assumed			.	.	.	2.17323	.	.	.
ATTITUTE	Equal variances assumed	.	.	2.701	126	.008	17.02362	6.30321	4.54975	29.49749
	Equal variances not assumed			.	.	.	17.02362	.	.	.
SUBNORMS	Equal variances assumed	.	.	-.429	126	.669	-2.09449	4.88794	-11.76757	7.57860
	Equal variances not assumed			.	.	.	-2.09449	.	.	.
SELFEFFI	Equal variances assumed	.	.	-.229	126	.819	-1.75591	7.66212	-16.91902	13.40721
	Equal variances not assumed			.	.	.	-1.75591	.	.	.

Research Question: Reliability

Phase III. Data Analyses- Item Analyses

Positive Belief Subscale
Alpha = 0.732

	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
Decreased mortality	.464	.759
Lower medical cost	.610	.581
Fewer side effects	.601	.592

	Decreased mortality	Lower medical cost	Fewer side effects
Decreased mortality	1.000		
Lower medical cost	.422	1.000	.612
Fewer side effects	.411	.612	1.000

Research Question: Reliability

Phase III. Data Analyses- Item Analyses

Variable	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
Sharing information	.829	.924
Sharing knowledge	.829	.925
Evaluating suitability	.859	.921
Recommending therapy	.814	.926
Referring patients	.793	.927
Applying knowledge	.743	.933
Evaluating literature	.714	.934

Perceived Behavioral Control

Alpha = 0.934

	Sharing info	Sharing knowle	Evaluat suitab	Recom mend	Refer patients	Apply knowle	Evaluat literature
Sharing information	1.000						
Sharing knowledge	.883	1.000					
Evaluating suitability	.818	.830	1.000				
Recommending	.725	.681	.742	1.000			
Referring patients	.714	.649	.723	.727	1.000		
Applying knowledge	.590	.612	.610	.699	.655	1.000	
Evaluating literature	.540	.606	.677	.603	.610	.686	1.000

Research Question: Reliability

Phase III. Data Analyses- Item Analyses

Negative Belief Subscale

Alpha = 0.739

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
Recurrence	4.76	2.839	**.586**	.343	.(a)
Inadequate surgery	4.93	2.935	**.586**	.343	.(a)

Research Question: Reliability

Phase III. Data Analyses- Item Analyses

Attitude Subscale

Alpha = 0.898

	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
SAFE	.700	.886
BENE	.771	.870
EFFECTIV	.741	.877
SATISFY	.772	.870
USEFUL	.756	.874

	Safe	Beneficial	Effective	Satisfying	Useful
Safe	1.000				
Beneficial	.620	1.000			
Effective	.544	.792	1.000		
Satisfying	.595	.648	.593	1.000	
Useful	.655	.561	.593	.775	1.000

Research Question: Reliability
Phase III. Data Analyses- Item Analyses

Behavioral Intention Subscale

Alpha = 0.807

	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
Apply knowledge	.501	.881
Refer trials	.785	.587
Recommend therapy	.743	.643

	Apply knowledge	Refer trials	Recommend therapy
Apply knowledge	1.000		
Refer trials	.501	1.000	
Recommend therapy	.448	.788	1.000

Research Question: Reliability

Phase III. Data Analyses- Item Analyses

Subjective Norm Subscale

Alpha = 0.906

	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
Share information	.827	.865
Share knowledge	.808	.875
Recommend therapy	.779	.887
Refer trials	.761	.888

	Share information	Share knowledge	Recommend therapy	Refer trials
Share information	1.000			
Share knowledge	.895	1.000		
Recommend therapy	.693	.644	1.000	
Refer trials	.641	.643	.773	1.000

Research Question: Reliability

Phase III. Data Analyses- Item Analyses

Factor	# Items in Scale	Factor Name	Alpha	Standardized Item Alpha
1	7	Perceived Behavioral Control	0.937	0.938
2	2	Positive Beliefs	0.759	0.759
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Final Instrument