Mixed Methods In Implementation Science
YSIS Session

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Overview of the session

What is mixed methods research?

When to consider mixed methods?

Managing mixed methods teams

Integration in mixed methods analysis

Discrepancy in analysis/discordance

Publishing mixed methods

What is mixed methods research?

Scientific approach that uses both quantitative and qualitative methods in a single study or series of studies to understand a research problem

Quantitative = magnitude and frequency of particular constructs

Qualitative = nature of same or related constructs

Mixing/integrating is essential (OR it is multiple methods)

Figure 1.1 Characteristics of Qualitative, Quantitative, and Mixed Methods Research

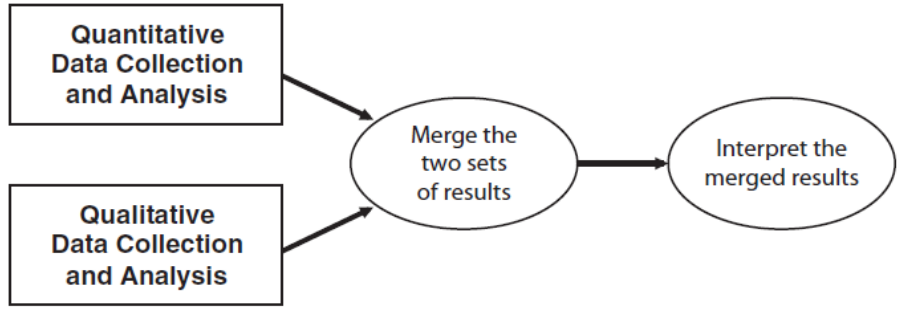
When to consider mixed methods?

Table. Focal Topics Well Suited for Mixed Methods and Illustrative Studies

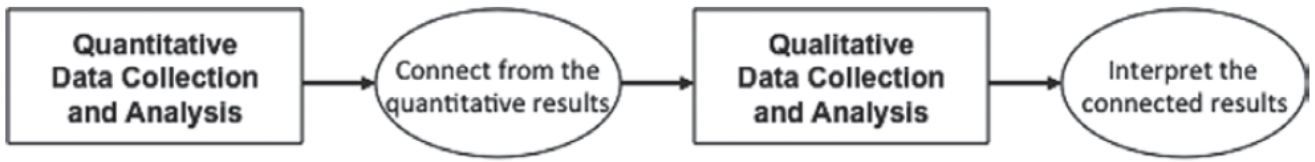
Focal Topic or Aim	Illustrative Study	Qualitative Component	Quantitative Component
Clinical or quality issue	Medication errors in computerized order entry systems[14]	Discover potential sources of error risk and characterize context in which errors occur	Quantify frequency of error risks reported by house staff
Organizational performance	Quality of AMI hospital care[23,24]	Describe complex processes and organizational environment	Identify factors associated with 30-day risk-standardized mortality rates
Complex intervention trials/RCTs	Secondary preventive follow-up care for patients with AMI or angina[25]	Clarify process and examine underlying theory to inform interpretation of quantitative results and future intervention designs	Assess impact of intervention on lifestyle and cardiovascular risk
Implementation science	Organizational readiness to adopt new protocol for acute stroke care[26]	Elicit patient and staff perceptions of facilitators and barriers to adoption	Assess organizational readiness with the Team Climate Inventory Questionnaire
Medical decision making	Informed consent for abdominal aortic aneurysm repair[20]	Characterize patient perspectives on informed consent process	Assess variation in surgeon reports and factors associated with variation
Develop quantitative measurement of a complex construct	Patient-centered measures of outcomes of treatment for prostate cancer[27]	Identify core facets of the phenomenon from patients' perspective	Develop and validate items and scales through psychometric testing

AMI indicates acute myocardial infarction; and RCT, randomized, controlled trial.

Convergent parallel design

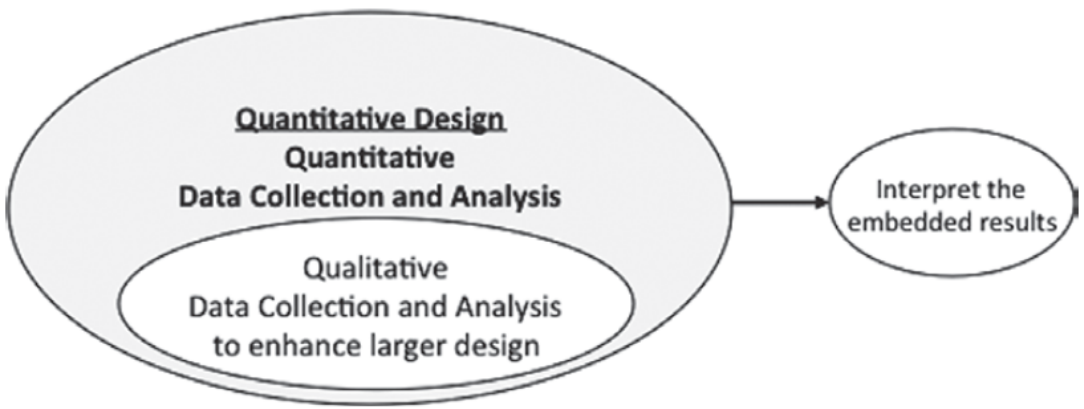


Explanatory sequential



Exploratory sequential

Embedded (example of qualitative embedded within a quantitative design)



Considerations in mixed methods

Relative timing of when each method is carried out

Emphasis on each component

Connections between components

- Unifying aim or research question
- A priori intention to conduct second component and design elements that facilitate linkage
- Degree to which findings feed iteratively into the design of the other
- Degree of integration of findings

Challenges of mixed methods

Time
(often more lengthy)

Resources
(often more costly)

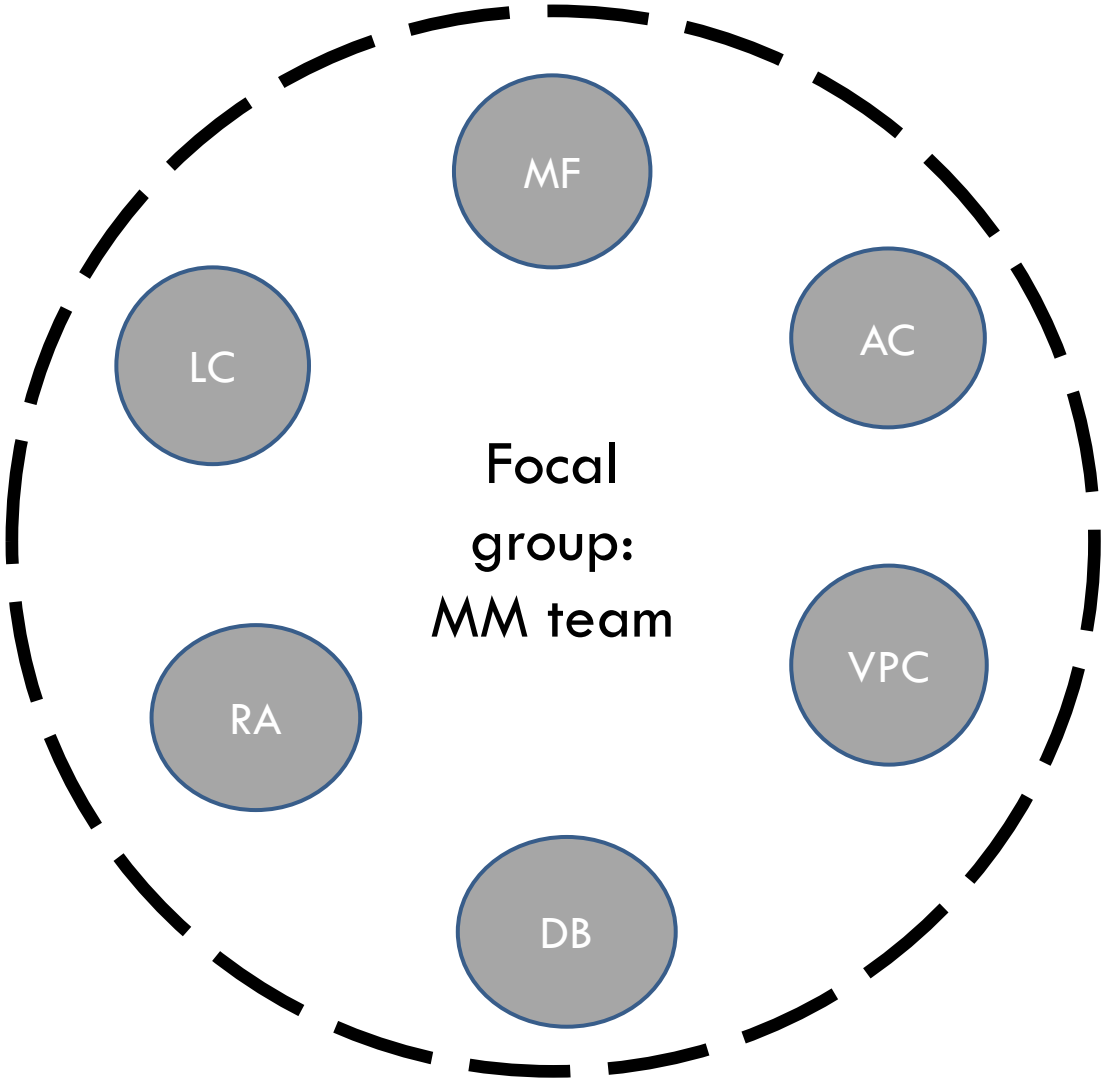
Finding mixed methods expertise

Coordination across components

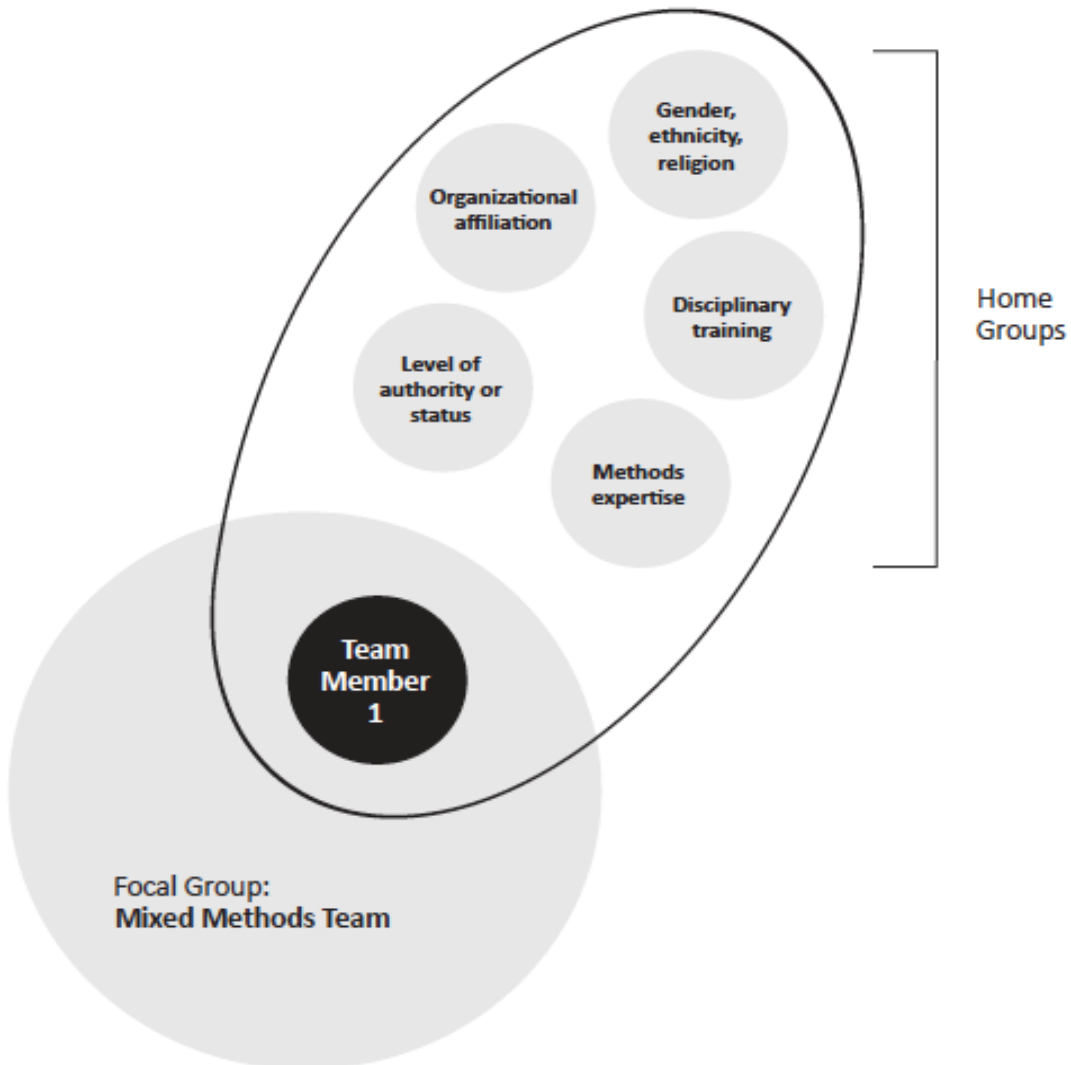
Perhaps the biggest…..Building and managing mixed methods teams

Managing mixed methods teams

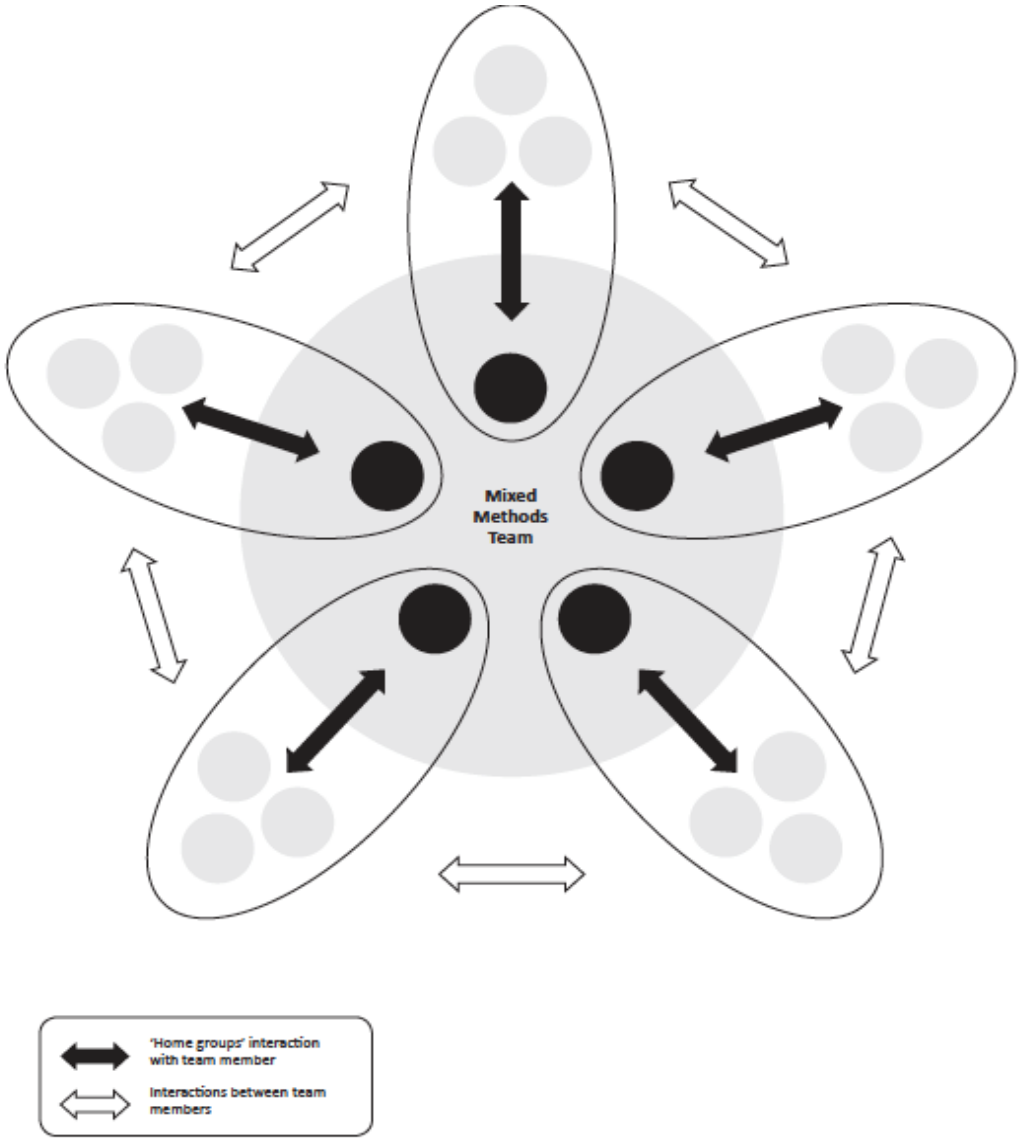
Individual-interpersonal view of MM team



Multiple Home Groups Represented by Each Mixed Methods Team Member



Group-intergroup view of MM team



"Berg's Kiwi"

Tools for managing dynamics

Include essential and complementary expertise

Explicitly define roles

Tend to group dynamics (ongoing)

Manage the project with both support and accountability

Curry LA, et al., The Role of group dynamics in mixed methods health sciences research teams. Journal of Mixed Methods Research, Epub 2011 Aug 29.

Example: Role definitions in analysis phase

Data analysis role	Person and time needed
Management and first coder: • **Prepare research team with interview and observation guides, recorders** • **Manage transcripts & Atlas files** • **File/track the observation notes** • **Enter and reconcile input from other coders** • **Code every transcript**	Emily, with backup as needed on Atlas from Sohini Management role: 20% effort weekly Coding: 10 hospitals (150 hours per round, 1 hour per tx)
Second coder:	Heather – 5 hospitals (50 hours per round, 1 hour per tx) Amanda – 5 hospitals (50 hours per round, hour per tx) Note: we will mix up assignments so Betsy and Signe are reading both Heather and Amanda's codes
First expert read:	Leslie – all hospitals (75 hours per round at 45min per tx)
Second expert read:	Betsy – 4 hospitals (30 hours at 45 min per tx) Signe – 6 hospitals (45 hours at 45 min per tx)
Additional reads:	LSL faculty as needed for breadth, especially those that conducted the specific visit being coded

Example: Gantt Chart

Tasks	2013				2014												2015												2016											
	Sep	Oct	Nov	Dec	Jan	Feb	March	April	May	June	July	Aug	Sep	Oct	Nov	Dec	Jan	Feb	March	April	May	June	July	Aug	Sep	Oct	Nov	Dec	Jan	Feb	March	April	May	June	July	Aug	Sep	Oct	Nov	Dec
Project Development																																								
Finalize project plan, including measures, sample, sampling frame	X	X	X	X																																				
Develop survey		X	X	X																																				
Engage partners/stakeholder groups		X	X	X																																				
Draw sample; enroll intervention hospitals					X	X																																		
Identify and engage networked hosptials							X	X																																
Quantitative Measures (Pre-Post)																																								
Field survey, incl practice, culture, & mortality - intervention hospitals								X												X												X								
Field survey, incl practice, culture, & mortality - networked hospitals									X											X												X								
Clean and analyze data								X	X	X										X	X												X	X							
Intervention																																								
Two-year intervention period							X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X										
Launch & annual meeting							X												X												X									
Hospital-specific workshops (every 6 months)								X	X						X					X	X						X													
Ongoing learning community support								X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X											
Qualitative Evaluation																																								
In-depth interviews at selected sites							X	X												X	X									X	X									
Analyze interview data								X	X	X											X	X	X									X	X	X						
Reporting and Dissemination																																								
Yale quarterly report to MDCO				X			X			X			X			X			X			X			X			X			X			X					
Yale final report to MDCO																																							X	
Dissemination of baseline and follow-up results											X	X	X	X								X	X	X	X									X	X	X	X	

Integration in mixed methods

Key points on integration

Integration brings quantitative and qualitative approaches together in a study (not in parallel aka multiple methods)

Data are interdependent in addressing common research questions and hypotheses

Produces a whole greater than the sum of the parts

BUT is not well developed or practiced

Table 1: Levels of Integration in Mixed Methods Research

Integration Level	*Approaches*
Design	3 Basic designs
	Exploratory sequential
	Explanatory sequential
	Convergent
	4 Advanced frameworks
	Multistage
	Intervention
	Case study
	Participatory—Community-based participatory research, and transformative
Methods	Connecting
	Building
	Merging
	Embedding
Interpretation and Reporting	Narrative—Weaving, contiguous and staged
	Data transformation
	Joint display

Fetters, Curry and Creswell, HSR, 2013

Resources on integration

Communicating integration in grant applications: Gutterman et al., 2019; O'Cathain

Key methods articles to cite in applications and papers: Fetters et al., 2013; Richards et al., 2019; Zhang and Creswell, 2013; O'Cathain 2010; O'Cathain 2007

Good examples of integrated findings in empirical papers: Leppin et al., 2018; Johnson et al., 2019; examples cited in Gutterman et al., 2016; Nelson 2015; Perfettti 2019

Examples of joint displays

Integrating Quantitative and Qualitative Results in Health Science Mixed Methods Research Through Joint Displays

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ABSTRACT

PURPOSE Mixed methods research is becoming an important methodology to investigate complex health-related topics, yet the meaningful integration of qualitative and quantitative data remains elusive and needs further development. A promising innovation to facilitate integration is the use of visual joint displays that bring data together visually to draw out new insights. The purpose of this study was to identify exemplar joint displays by analyzing the various types of joint displays being used in published articles.

METHODS We searched for empirical articles that included joint displays in 3

Figure 1. A joint display from an exploratory sequential design that maps qualitatively derived codes to items.

Table 2. Patient Experience of Continuity of Care: Subscale Description and Item Provenance

Dimension	Response Format	Item Content	Item Inspiration
Pertaining to main health care clinician (management, relational)			
Coordinator role (5 items)	Evaluative (hardly at all to totally)	Assessment of how well coordinator knows all health care needs, maintains regular contact with the patient, contacts other clinicians, and helps patient getting care from other clinicians (only answered by those with identified coordinator)	ACSS-MH[10] PACIC[25] 2 new
Comprehensive knowledge of patient (4 items)	Evaluative (hardly at all to totally)	How much doctor takes into account the patients whole medical history, worries about health, responsibilities at home and personal values? (only answered by those with a personal doctor)	PCAS[13]
Confidence and partnership (3 items)	Evaluative (hardly at all to totally)	Importance given to patient ideas about care, comfort in discussion of sensitive issues, confidence that doctor will look after patient (only answered by those with a personal doctor)	PCAT-ae[14] 2 New
Pertaining to several clinicians or team (team relational, management, informational)			
Confidence in team (2 items)	Evaluative (hardly at all to totally)	Assessment of how well the patient feels known and can count on members at regular clinic.	ACSS-MH[10] PCCQ[5]
Role clarity and coordination (3 items each, (2 subscales)	Reporting (never to almost always)	Frequency of clinicians not working well together or giving the patient conflicting information (asked in reference to clinicians in own clinic and separately, between clinics, and elsewhere)	CPCQ[26] VANOCSS[18] 1 New
Information gap between clinicians	Reporting (never, sometimes, often	Frequency of information transfer problems: clinicians do not know recent history, results of recent tests, or changes made by other	VANOCSS[18] DCCS[7]

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Figure 2. A joint display from an explanatory sequential design that is organized by a theoretical framework and relates categorical scores to quotes.

Table 4. Quotes Related to Lanham et al's Relationship Characteristics in Clinics with High and Low WRS Scores

Rich communication	
Communication through face-to-face conversation; most effective when messages are unclear or ambiguous	
Low WRS score clinics	"I think that some days we should just sit down and say, 'Okay, this is what's going on. What do you know—how do you perceive this is supposed to be done?' ...[S]ometimes the hurdles that we run into are just, they could have been easily avoided if there had been a little bit better communication."
High WRS score clinics	"Well, you know we have what's called huddle every morning and any problems from the day before are discussed in huddle with all the team members and the clerical staff, social workers, the pharmacist. So we all get to know anything that's going on at that time."
Heedful interrelating	
Individuals are attentive to their work tasks and sensitive to how their roles and actions affect and intersect with those around them	
Low WRS score clinics	"...[T]here's a whole lot of tension and a lot of it has to do with, 'That ain't my job and you're messing in my area and you don't belong in my area and you need to back out and just stay in your own business.'"
High WRS score clinics	"I think the teamwork here is just excellent. You know we really pitch in and try and help. Everyone's attitude basically is that if one person's working hard, we're all working hard."
Trust	
Individuals feel safe in making themselves vulnerable to others	
Low WRS score clinics	"Some people are probably not going to verbalize a lot, because they're afraid it might get back to their boss or... because they don't want to rock the boat."
High WRS score clinics	"So, I have learned so much about medicine itself from these people; they're [illegible] not afraid to approach them for whatever

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Figure 3. A cross-case comparison joint display from a convergent design showing scored items and descriptions.

Table 3. Cross-Case Comparison Using Three Participants and Mixed Methods Integration of Quantitative Scores and Qualitative Assessments

Domain	Variables	Participant 1	Participant 2	Participant 3
Knowledge cognition		DHFKS total = 14 DSST = 25, PMR = 2	DHFKS total = 14 DSST = 23, PMR = 0	DHFKS total = 15 DSST = 46, PMR = 4
Self-care maintenance	SCHFI score Diet, monitoring exercise, and medication	100 Follows low-fat and low-salt diet, fluid 2 L restriction, weighs self daily, exercises 2-3 times per week, pillboxes for medication	90 Follows 2 grams low-salt diet; takes lunch to work. Checks and records blood pressure and writes weights on calendar. Exercises on treadmill each day. Medication log	60 Low-salt diet "used to be better," now has dietary indescretions. Tries to exercise regularly but not consistent. Medication routine: Medicines make the participant tired, so sometimes "is lazy to take"
		Cheats (on diet) and manages (symptoms)	*Self-care maintenance as routine*	*Inconsistent self-care*
Self-care management	SCHFI score Symptom monitoring, symptom recognition, symptom importance, action, symptom improvement	87.57 Checks ankles and daily weights, records data, and in presence of symptoms eats less salt; diuretic titration; energy conservation. Recognizes that increased urination and weight loss indicate improvement	74.21 Daily weights, checks blood pressure symptoms such as hyperventilating. with symptoms, rests or stops activity, calls health care provider immediately. Improvement noted as breathing eases. Also has external defibrillator	67 Daily weights (or 3 times/week). "Knows body" and relies on intuition to identify symptoms. Often will just work through symptoms and wait to see if feels better. Does not pay attention to some symptoms (e.g., what is fatigue from HF, from work, and from motherhood)
		Consistent self-care *Symptom vigilance*	*Consistent self-care* *Symptom vigilance*	*Lacks vigilance* *Watches and waits on symtoms*
Knowledge	HF	Heart is weakened	Heart arrhythmia	Describes postpartum

Reprinted with permission from *J Mixed Methods Res.* 2011;5(2):167-189.[33]

Figure 4. A joint display from a mixed methods intervention design that presents qualitatively derived implementation practices with quantitative screening rate results.

Table 5. Qualitative Assessment of Quality Improvement Implementation (Intervention Practices)

Practice	Team Structure	Leadership	Engagement	Psychological Safety	Intra-communication	Inter-communication	CRC Screening Rates	
							Baseline (%)	12-Month Follow-up (%)
P2[a]	Strong	Moderate	Strong	Strong	Strong	Moderate	14	30
P7	Strong	Weak	Moderate	Weak	Moderate	Weak	53	73
P8[a]	Strong	Moderate	Strong	Moderate	Moderate	Weak	37	52
P10[a]	Strong	Moderate	Moderate	Moderate	Strong	Strong	71	33
P11	Weak	Weak	Moderate	Weak	Moderate	NA	54	66
P15	Moderate	Weak	Moderate	Weak	Moderate	Weak	50	67
P16[a]	Strong	Strong	Strong	Strong	Strong	Weak	43	48
P17	–	–	–	–	–	–	41	10
P19[a]	Strong	Strong	Strong	Strong	Strong	NA	52	44
P21	–	–	–	–	–	–	38	56
P22[a]	Strong	Weak	Moderate	Moderate	Moderate	Weak	47	71
P23[a]	Strong	Moderate	Strong	Strong	Strong	Weak	93	86

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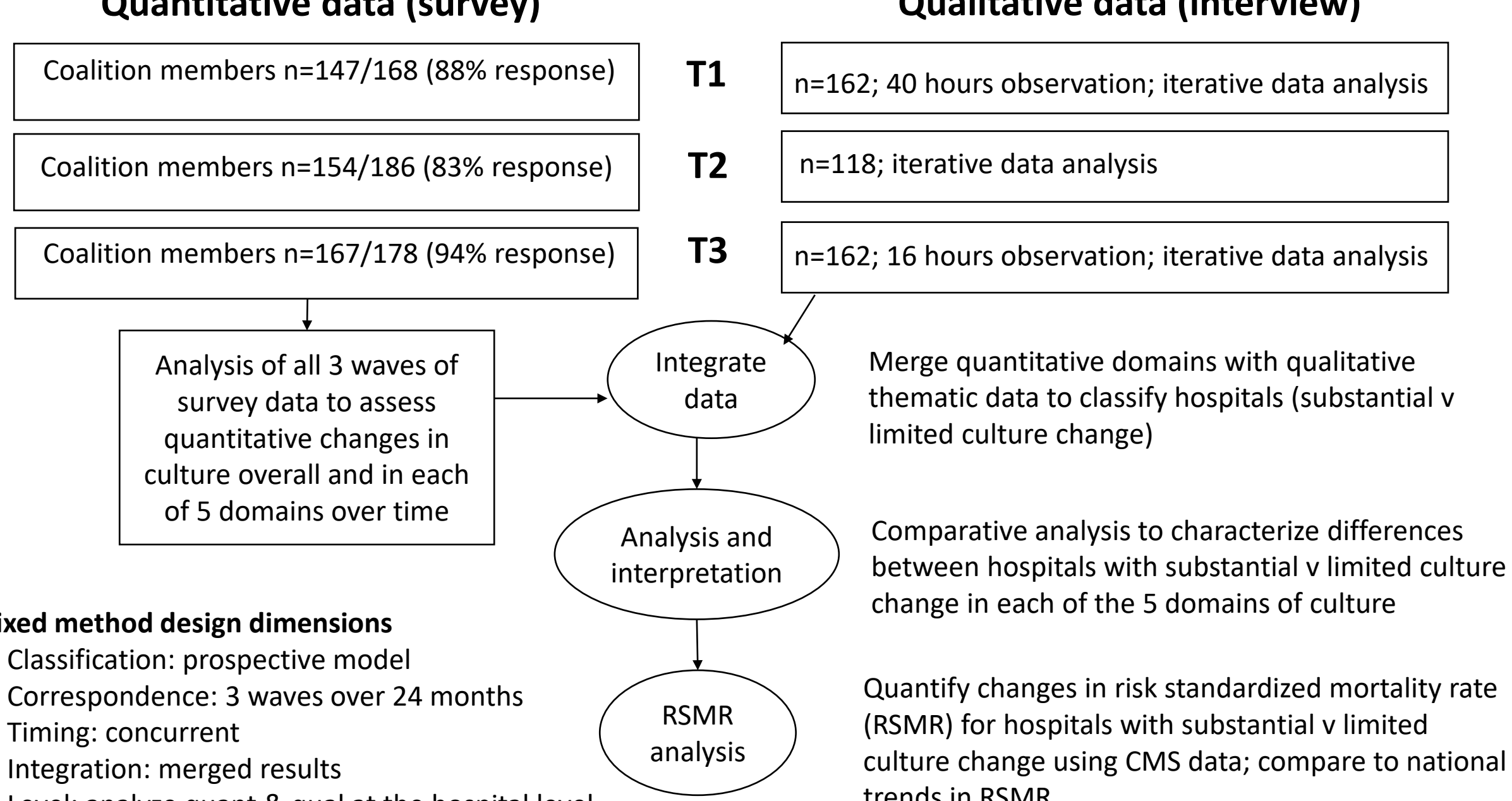

Mixed method design dimensions

- Classification: prospective model
- Correspondence: 3 waves over 24 months
- Timing: concurrent
- Integration: merged results
- Level: analyze quant & qual at the hospital level
- Use of time: longitudinal quan & qual analysis to classify hospitals whether changed over time

Discordance in analysis

Discordance need not be a bad thing!

Requires team to engage more extensively with the data to explore both complexity and contradictions

Allows team to evaluate rival explanations

Refines limitations of findings

Can develop a richer, more in-depth understanding of a phenomenon, thus lending credibility

Resources on discordant data

- Tonkin Green et al., 2019
- Pluye et al., 2009
- Booth et al., 2013
- Moffatt et al., 2006

Publishing mixed methods

Decide the number of manuscripts

Create an explicit publication plan and tentative author groups as early as possible

Aims determine focal topics and primary audience/s

Timing of when findings are available

Characteristics of journals in given discipline

LSL Publication Plan
3/17/16

The first paper has been published in Implementation Science. The remaining papers are noted below with planned authors for each. In addition, the qualitative dataset will offer a number of opportunities for manuscripts reporting findings from focused analyses, including both theory generation and empirical results. Team members interested in developing a particular manuscript are encouraged to submit a proposal for consideration, using the process set out in the publication policy.

Paper 1: What distinguishes high performance improving hospitals ("the culture paper" role of organizational culture in adoption of innovations). Target journals in this order: Annals of Internal Medicine, BMJ, Implementation Science)

> Identify high and low adopting hospitals using quantitative data on strategies and describe differentiating features (primarily organizational culture, though there may be external factors as well). Unit of analysis is the hospital. Mixed methods (wave 1 and 3 survey data on strategies; all three waves of full set of qualitative data).
>
> Authors: Curry, Brault, Flieger, Linnander, McNatt, Ting, Bradley

Paper 2: Uptake, adaptation and integration of evidence-based strategies to reduce AMI mortality ("the strategies paper" target journals in this order: Annals of Internal Medicine, Circulation, Journal of American College of Cardiology)

Choose your target journal

Specialized mixed methods or disciplinary journal?

Explore wide range of options

Search disciplinary-specific journals

Contact editorial office

Consider special issues

Create a strong author team

Multidisciplinary authors essential

Be mindful of size!

Include specific, credible mixed methods expertise

Also need skill in communicating mixed methods to audiences unfamiliar with methods

Box 11.8 Good Reporting of a Mixed Methods Study (GRAMMS)

1. Describe the justification for using a mixed methods approach to the research question;
2. Describe the design in terms of the purpose, priority, and sequence of methods;
3. Describe each method in terms of sampling, data collection and analysis;
4. Describe where integration has occurred, how it has occurred, and who has participated in it;
5. Describe any limitation of one method associated with the presence of the other method; and
6. Describe any insights gained from mixing or integrating methods.

Source: O'Cathain A, Murphy E, Nicholl J. (2008). The quality of mixed methods studies in health services research. Journal of Health Services Research and Policy, 13(2), 92-8. doi: 10.1258/jhsrp.2007.007074.

Write with the audience in mind

Pay close attention to avoid jargon (have naive reader review)

Define all essential terms in a coherent clause and include citations

Address data integration in methods with cites

Select optimal presentation format for results

Reality of space constraints

Methods section includes information regarding the design, sample, data collection and analysis for multiple study components

Findings section requires reporting different types of data in different ways, as well as the integration

May require some compromise on depth

Strategies for dealing with space limits

Several articles in the same journal

Publish methods in a separate article as feasible

Choose a journal that allows for longer articles

Use online appendices

Creative methods for joint data displays

THANK YOU!

CONVERSATION