Postsurgical pain and recovery in children

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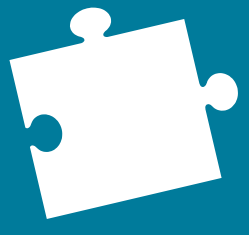
Objectives



- Choose a research topic
- Choose a mentor
- Negotiate funding
- Start a research career

Disclosures

- None

Outcomes in children after surgery

Pain Outcomes

- Over 4.5 million children have surgery in U.S. annually[1]
- Half of children admitted after surgery have moderate-severe pain[2]
- This is unchanged over past 2 decades[3]
- Chronic postsurgical pain rates range from 13 to 52%[4]

[1]Rabbitts, et al., 2010

[2]Groenewald, Rabbitts, et al., 2012

[3]Cummings, et al., 1996; Taylor, et al., 2008

[4]Wong, Yuen, et al., 2007; Kristensen, Pedersen, et al., 2010; Fortier, Chou, et al., 2011; Page, Stinson, et al., 2013

Outcomes in children after surgery

Pain Outcomes

- Multidimensional experience
- Biopsychosocial impact
- Assessment domains[1]
  - Pain intensity
  - Physical function
  - Emotional response

[1]PedIMMPACT; McGrath, Walco, et al., 2008 (Pediatric Initiative on Methods, Measurement, and Pain Assessment in Clinical Trials)

Outcomes in children after surgery

Functional Outcomes

- Impact of postsurgical pain on health outcomes is unknown
- Health-related quality of life decreased in children undergoing specific surgeries[1]
- Functional outcomes in broader pediatric postsurgical population are unknown

[1]Bekkering, Vliet Vlieland, et al., 2010;
Landolt, Buechel, et al., 2008;
Devine, Reed-Knight, et al., 2010

Predictors of Health Outcomes

Which children are at risk for poorer pain and health outcomes after surgery?

Hypothesized factors

- Biological factors: age[1]
- Psychological factors: anxiety[3], sleep patterns[4]
- Social factors: parental anxiety[6]

[1]Kotzer, 2000*
[2]Kalkman, Visser, et al., 2003+
[3]Page, Stinson, et al., 2012*
[4]Kain, Mayes, et al., 2002*
[5]Khan, Ahmed, et al., 2011+
[6]Bringuier, Dadure, et al., 2009*
*pediatric acute pain studies, +adult studies

Predictors of Health Outcomes

Which children are at risk for poorer pain and health outcomes after surgery?

Hypothesized factors

- Biological factors: age[1], gender[2], pain history [2]
- Psychological factors: anxiety[3], sleep patterns[4], pain catastrophizing[5]
- Social factors: parental anxiety[6]

[1]Kotzer, 2000*
[2]Kalkman, Visser, et al., 2003+
[3]Page, Stinson, et al., 2012*
[4]Kain, Mayes, et al., 2002*
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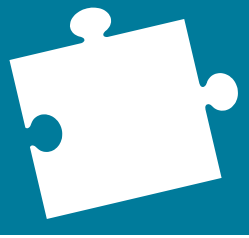
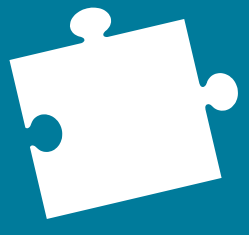
Getting started



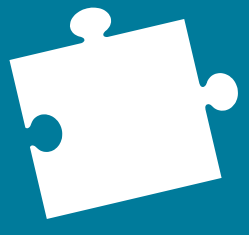
- Research idea
- Research training
- Mentor
- Funding
  - etc…

Getting started



- Research idea
- Research training
  - Research fellowship
  - Faculty fellowship
  - T32 NIH institutional research training grants

Getting started

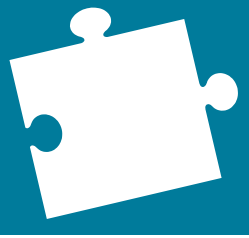


- Research idea
- Research training
- Mentor

  *key to each step

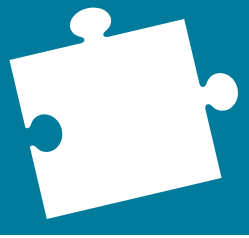
  - Project
  - Resources
  - Collaborations
  - Grant writing
  - Departmental commitment

Getting started



- Research idea
- Research training
- Mentor
- Funding
  - Startup support
  - Institutional grants

Getting started



- Research idea
- Research training
- Mentor
- Funding
- Planning study
  - Research team
  - Resources

Study Aims

1. Characterize trajectories of pain and their relationship to health and functional outcomes in children undergoing major surgery.
2. Identify clinical, psychological, and behavioral factors that predict postsurgical pain, physical function and quality of life in children after major surgery.

Procedures

- Longitudinal prospective study
  - 60 youth age 10-18 years
  - Undergoing spinal fusion, pectus repair
  - Otherwise healthy
- Assessments: baseline, 2 weeks, 4 months, 1 year
  - Questionnaires: anxiety, catastrophizing, pain, QOL
  - Daily monitoring: Pain diary, actigraphy
- Assessments: In-hospital:
  - Clinical data

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Daily monitoring

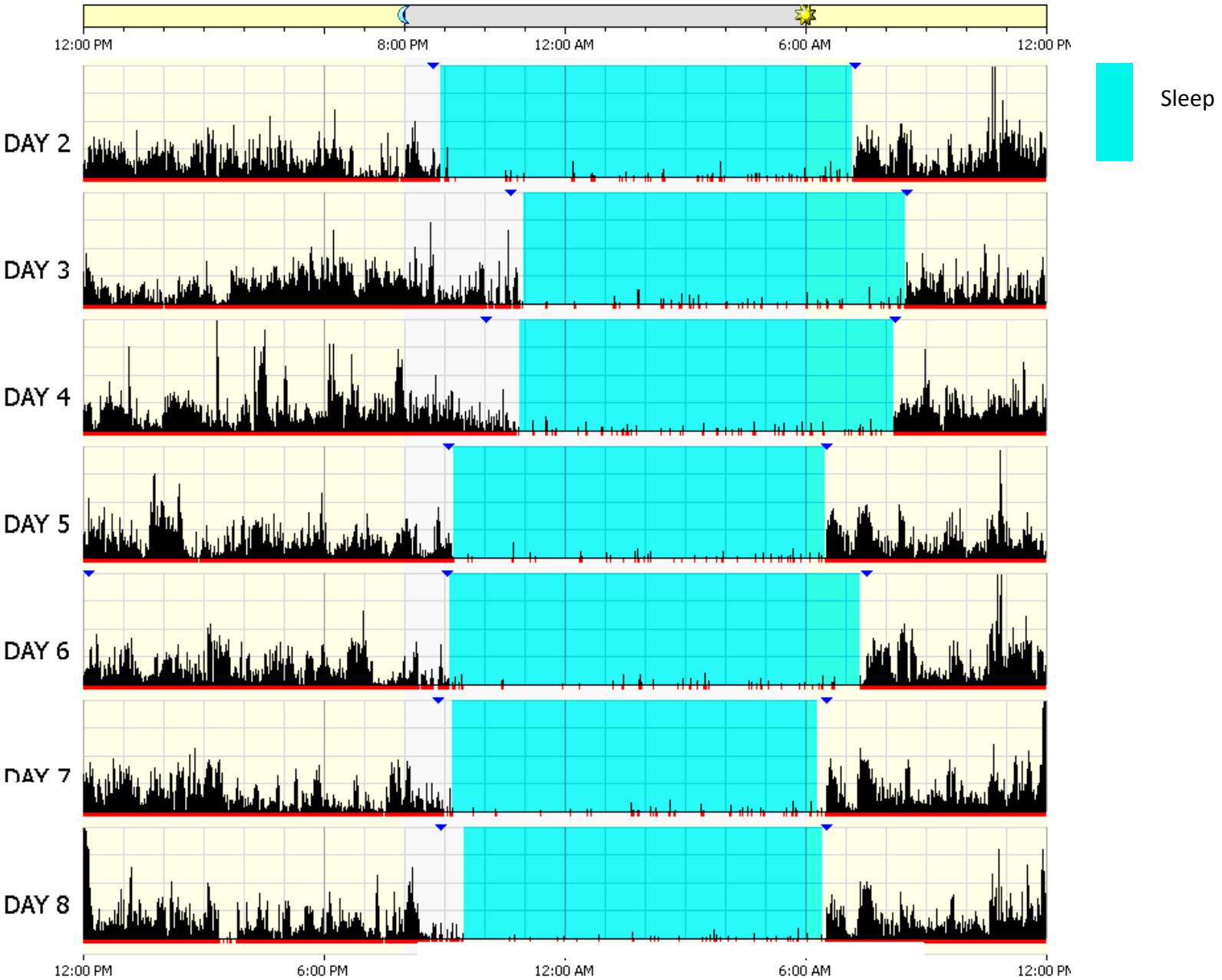
- Daily electronic diary[1]
  - pain and medication use
  - 7 days

- Actigraphy
  - physical activity levels[2]
  - sleep patterns[3]
  - 7 days

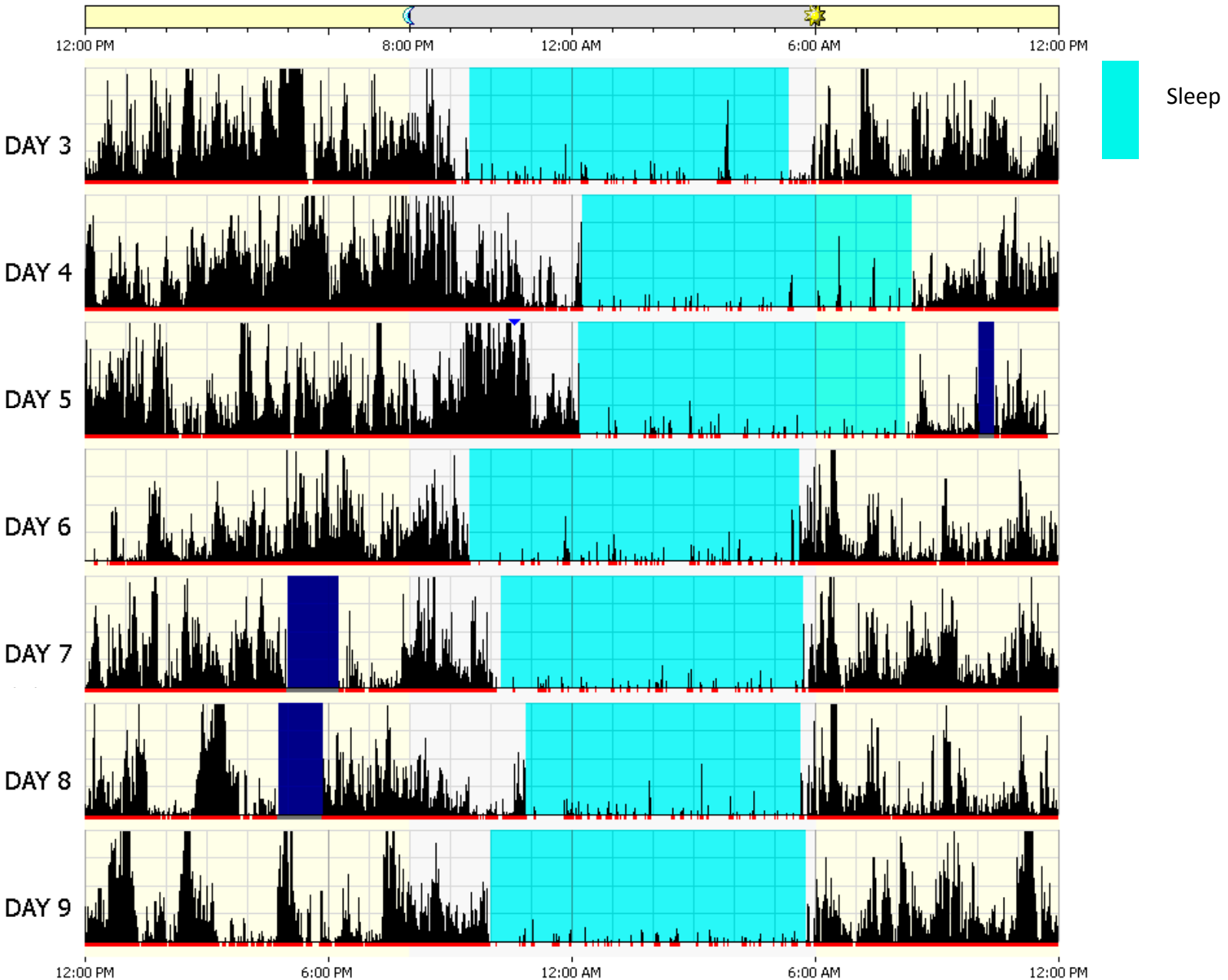
Mentor

[1]Palermo, Valenzuela, et al., 2004
[2]Rabbitts, Lewandowski Holley, Palermo, et al., 2012
[3]Lewandowski, Palermo, et al., 2010

Low to medium physical activity



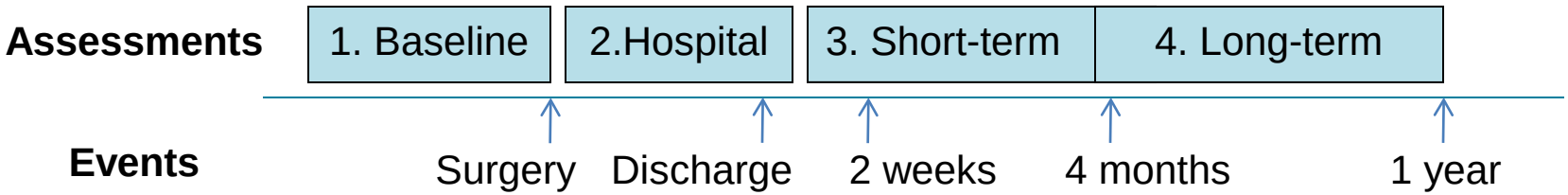
High physical activity



Recruitment

108 eligible children
- **9** unable to reach in time
- **39** declined

60 enrolled
- **2** dropouts



Peds-CRC
Surgery team

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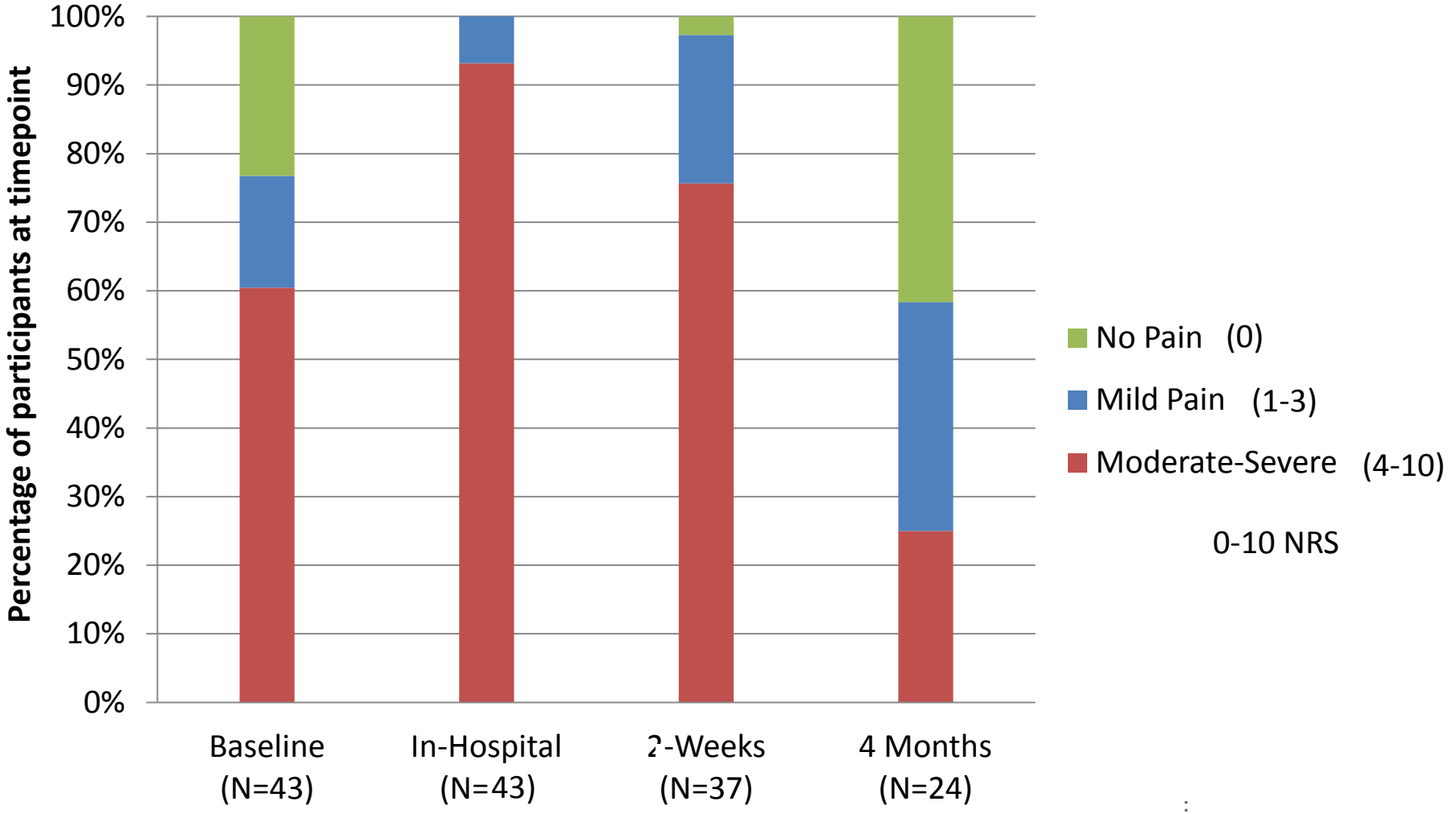
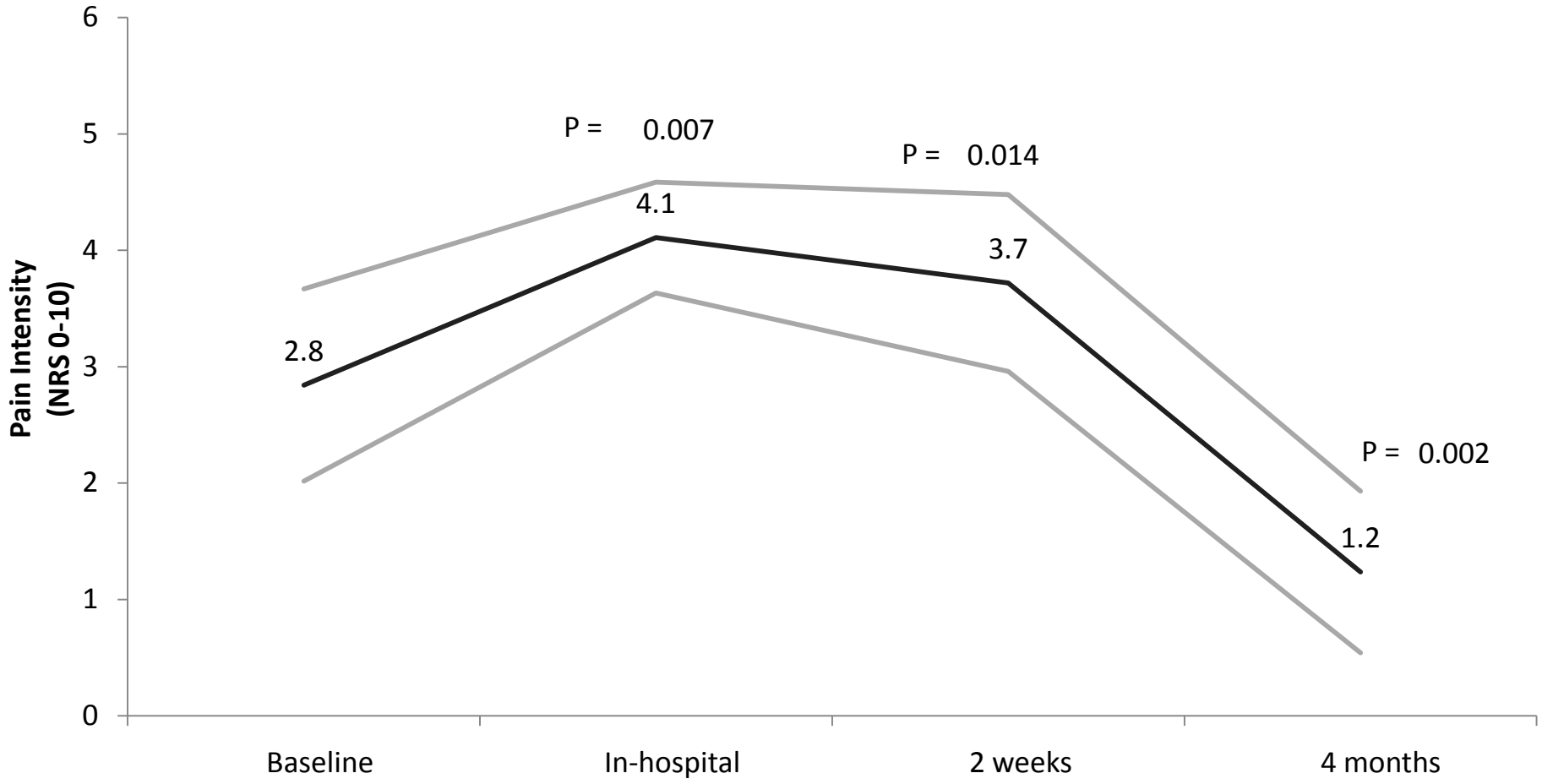
Preliminary data

Variable	M (range) or N(%)
Age – years	14.8 (10-18)
Sex – female	42 (70%)
Ethnicity – Caucasian	53 (87%)
Surgery Spinal fusion Pectus	 49 (82%) 11 (18%)
Duration of surgery – hours	5.0 (1.8 - 8.8)
Length of stay – days	4.5 (2.0 – 9.0)

Pain prevalence



Longitudinal course of pain intensity over 4 months



GEE population averaged modeling adjusted for age and gender

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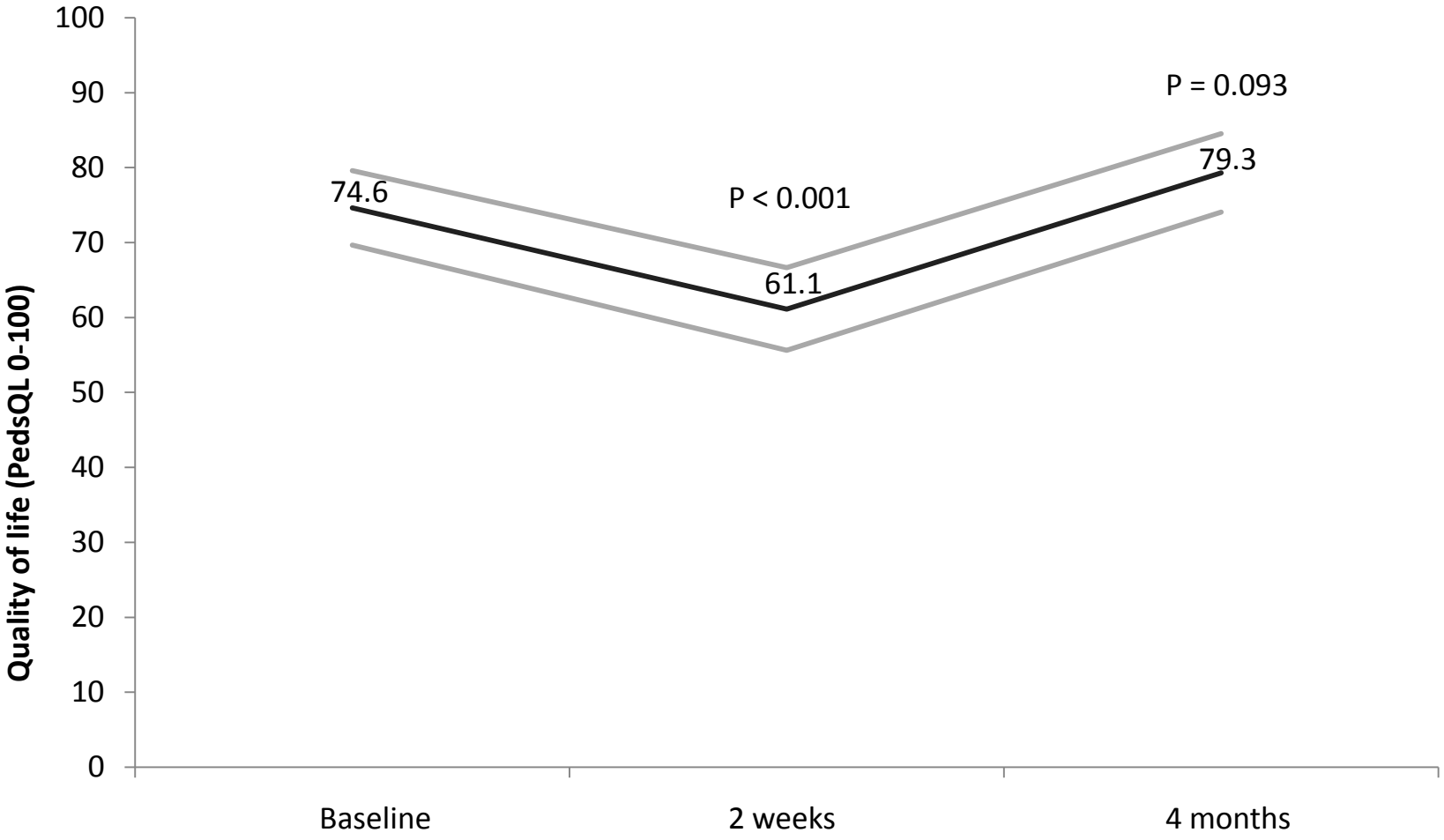
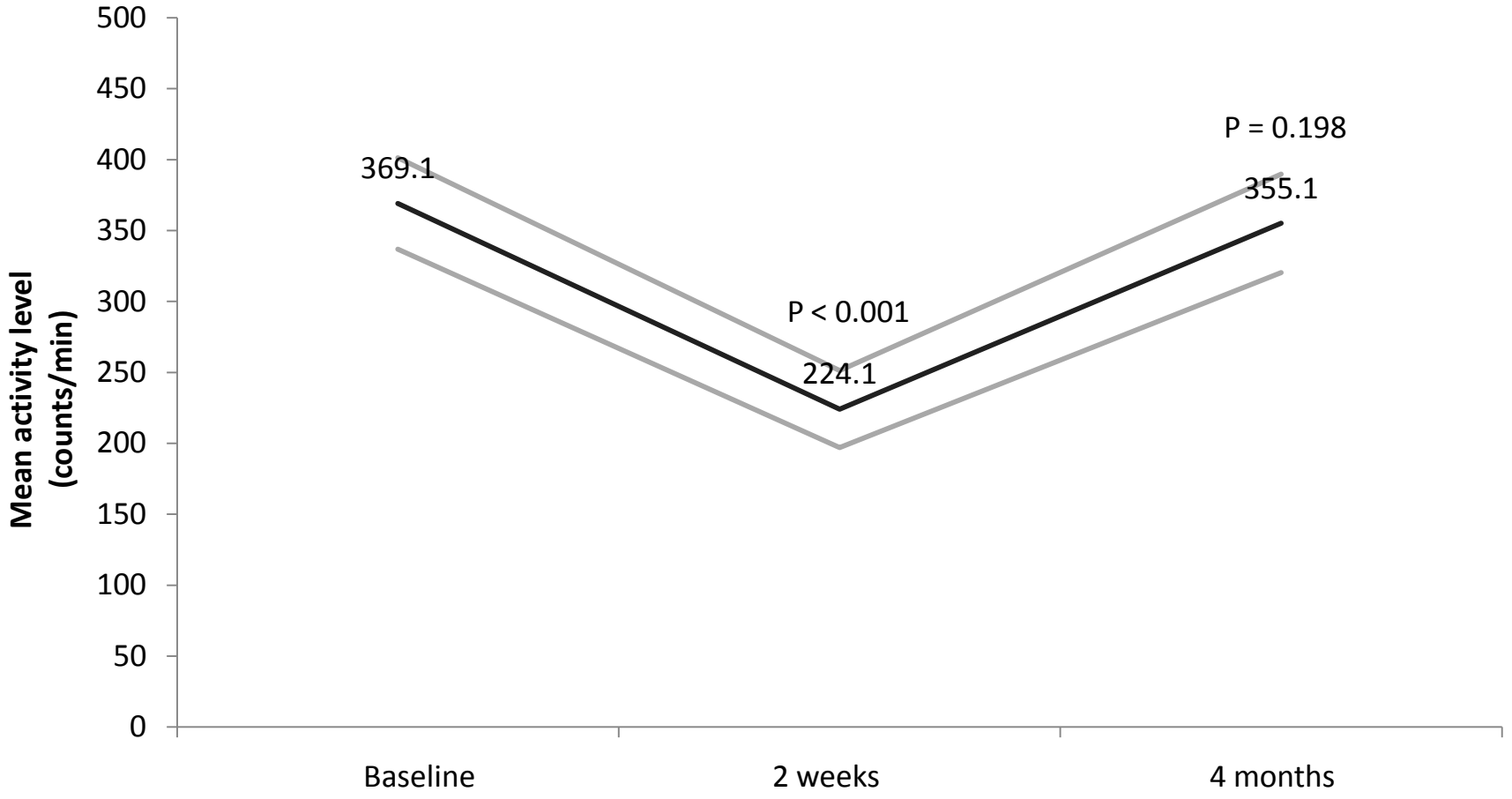
Longitudinal course of quality of life over 4 months



GEE population averaged modeling

Longitudinal course of physical activity over 4 months



GEE population averaged modeling adjusted for age and gender

732 days of actigraphy data used for analysis

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Baseline predictors of acute postsurgical pain

Predictors of maximum pain	In-hospital pain		Pain at 2-weeks	
	β	(SE)	β	(SE)
Pain catastrophizing (rumination)	0.21	(0.10)*	0.03	(0.10)
Baseline sleep (minutes)	-0.02	(0.13)*	-0.01	(0.01)
Baseline pain	0.08	(0.13)	0.53	(0.16)*

*p=<0.05, linear regressions adjusting for age, gender, and surgical procedure

Rabbitts, Groenewald, et al., 2014

Planned analyses

- Trajectories of pain, activity and quality of life
  - Identify subset with persistent pain and poorer outcomes
  - Examine predictors of pain and functional trajectories
- Temporal relationships between daily pain, activity and medication usage
  - Rabbitts, Holley, Karlson, Palermo: Bidirectional Associations between Pain and Physical Activity in Adolescents. Clin J Pain. 2013

Existing dataset

Collaboration

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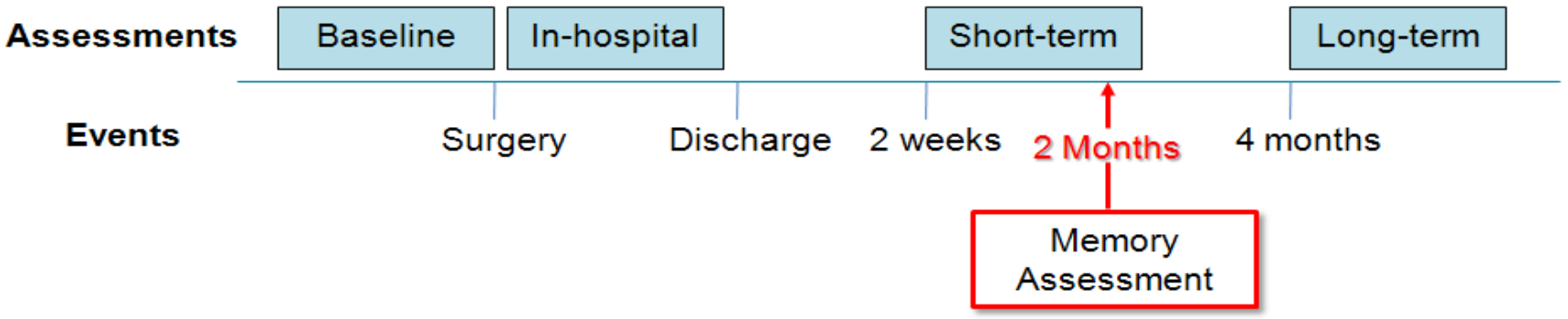
Memory of pain

- Model of acute pain memory development[1]
- Parents and children report memories of postsurgical pain



- Test predictors of pain memories and whether memories for pain mediate the relationship between early and late pain

Mentoring/ collaboration

[1]Noel, Chambers et al., 2013

Pain and Quality of life

- Health-related quality of life:
  physical, psychological, and social function
- HRQOL (PedsQL) is measured in every child as part of the Outcomes Assessment Program
- Change in HRQOL predicts readmission rate of hospitalized children[1]
- How does pain affect quality of life in children after surgery?

[1]Mangione-Smith, et al., 2011 (Outcomes Assessment Program)

Pain and Quality of life

Variable	M (range) or N(%)
Age – years	7.3 (1 month - 18 years)
Sex – female	579 (47%)
Ethnicity – Caucasian	686 (56%)
Medical complexity[1] Acute Chronic Complex chronic	 535 (44%) 344 (28%) 344 (28%)

[1]Pediatric Medical Complexity Algorithm, Simon, Cawthon, Mangione-Smith, et al., 2013

Pain and Quality of life

1 month postop

- 6.5% moderate-severe pain
- 10.2% pain 5 or more days a week
- 10.6% greater intensity pain than baseline

Pain and Quality of life

Change in HRQOL (baseline- 1 month)	
Predictor	P-value
Pain intensity (1 month)	<0.001
Change in pain intensity (baseline-1 month)	<0.001

*linear regressions adjusting for age, baseline pain, chronic illness and hospital LOS
Rabbitts, Mangione-Smith, Palermo, 2014

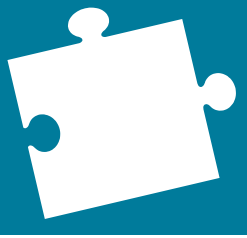
Institutional infrastructure

Co-mentor (health outcomes)

Future directions

- Neural mechanisms of postoperative pain
  - Sympathetic nervous system function
  - Descending neural inhibitory control
- Medical and behavioral interventions to improve pain and health outcomes in children after surgery
  - Sleep
  - Anxiety
  - Parental skills
  - Pain management

Extramural Funding



Tips for career development applications

- Area of expertise
- Research experience
- Record of funding
- Preliminary data
- Interdisciplinary mentorship team
- Institutional resources
- Institutional commitment