

# *Preventing pneumonia after surgery*

## *Preoperative physiotherapy providing BANG for buck*

**Dr Ianthe Boden** *PhD, MHSci, B. Physio*

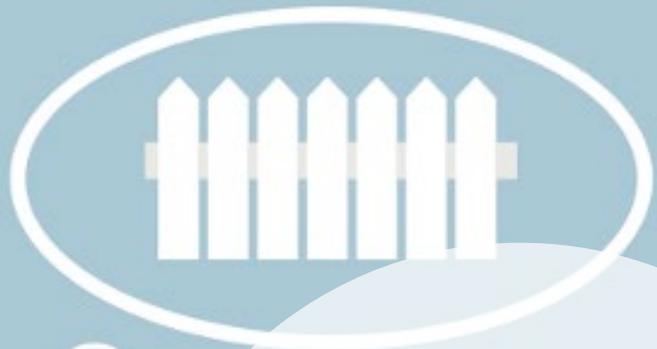
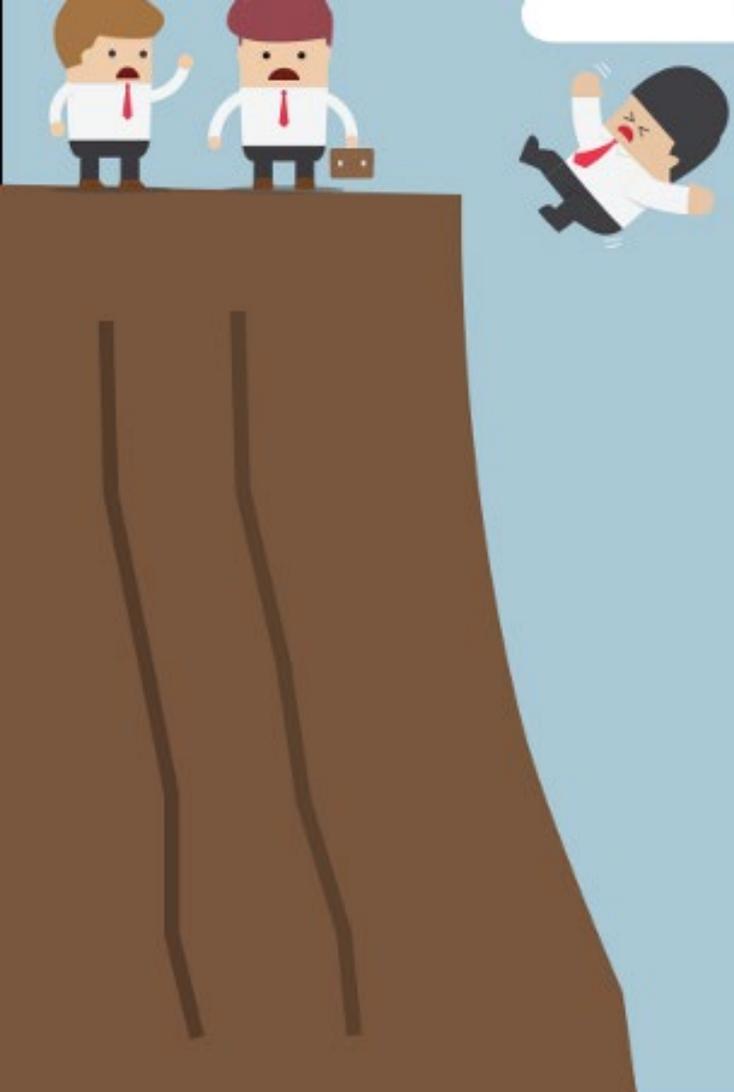
*Cardiorespiratory Specialist Physiotherapist  
Launceston General Hospital  
Launceston, Tasmania, Australia*

*Senior Lecturer  
University of Tasmania  
College of Health and Medicine*

TASMANIAN  
HEALTH  
SERVICE



UNIVERSITY of  
TASMANIA 



**Can physios prevent pneumonia after major surgery?**



## Pre-op education versus post-op education

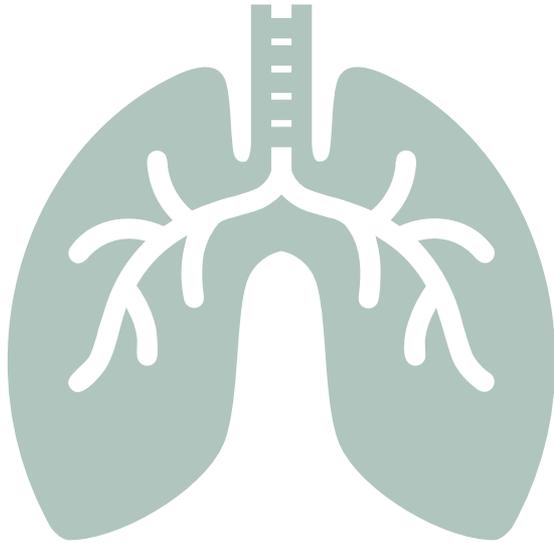
“It’s important to do your breathing exercises and get walking as soon as possible”

PRE-OP



POST-OP





## Clinical trial phase – Pilot

1. Do patients value preop physio?
2. Do they remember to do the breathing exercises that we teach them after the operation?



ELSEVIER

Physiotherapy 104 (2018) 194–202

Physiotherapy

Physiotherapy education and training prior to upper abdominal surgery is memorable and has high treatment fidelity: a nested mixed-methods randomised-controlled study

Ianthe Boden<sup>a,b,c,\*</sup>, Doa El-Ansary<sup>b</sup>, Nadia Zalucki<sup>a</sup>, Iain K. Robertson<sup>c,d</sup>,  
Laura Browning<sup>b,e</sup>, Elizabeth H. Skinner<sup>b</sup>, Linda Denehy<sup>b</sup>



CrossMark

*"(Pneumonia) that was **the one thing I really didn't want to have...** I thought the whole process of giving you that information and **making sure that you're aware that these are the steps you need to take post-surgery** to make sure that you get up and get going and aid your recuperation...it's very important"*

*"**No, can't remember what was in that booklet.** But I still do have it. Got it in me bag. Yeah. I think it helped that I met one-on-one with her. Like **it would have been no good if I just got a bit of paper in the mail saying you know this and this and this...** **meeting face-to-face was a lot better.**"*

**Preventing pneumonia is really important to patients**

**They found the physio education fascinating, interesting, and meaningful.**

**Patients preferred face to face information delivery and not by a booklet**

*"Just interesting, she went into what happens in your lungs and **the little hairs and how they do their little Mexican wave,** that really intrigued me that. And how I need to keep that working because the stuff from clogging up from there, and so the **deep breathing exercises were important for that reason, to keep pneumonia at bay.** I suppose you seem to focus on the things that sort of stick out, and the more mundane stuff that you're up to speed with, you put that aside and think, well I know that."*

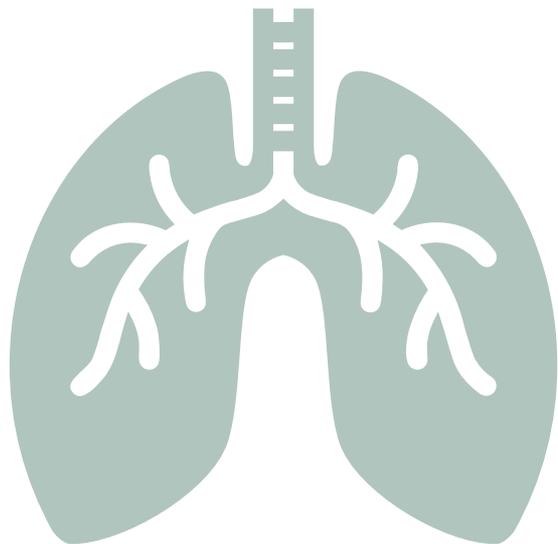
# Is preoperative physiotherapy memorable?

## Do patients remember their breathing exercises?



MEICINE

	INFO BOOKLET n=13	PRE-OP PHYSIO n=16	OR (95%CI)	P value
Physiotherapy most memorable session in all of pre-admission clinic	1%	81%	11 (1.6 to 70)	<0.001
Remembered meeting a physiotherapist	69%	94%	1.6 (0.6 to 3.1)	0.08
Recalled DB&C exercises	8%	94%	6 (1.7 to 22)	<0.001
Early ambulation	15%	75%	5 (1.3 to 18)	0.001
Lung physiology, mucociliary clearance	0%	50%		0.003
Nothing	39%	0%		0.006



**Clinical trial phase 2**

**Randomised controlled  
superiority trial**

# LIPPSMAck POP trial (Boden *BMJ* 2018)

## Lung Infection Prevention Post Surgery (Major Abdo) with Pre-Operative Physiotherapy

Boden I<sup>1,2</sup>, Skinner EL<sup>2</sup>, Browning L<sup>2,3</sup>, Robertson I<sup>4</sup>, Reeve J<sup>5,6</sup>, Story D<sup>2</sup>, and Denehy L<sup>2</sup>

<sup>1</sup>Launceston General Hospital, <sup>2</sup>University of Melbourne, <sup>3</sup>Western Health, Melbourne, <sup>4</sup>University of Tasmania, <sup>5</sup>Auckland University Technology, <sup>6</sup>North Shore Hospital, Auckland



### Aim:

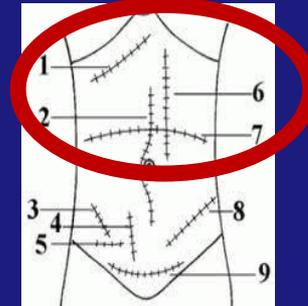
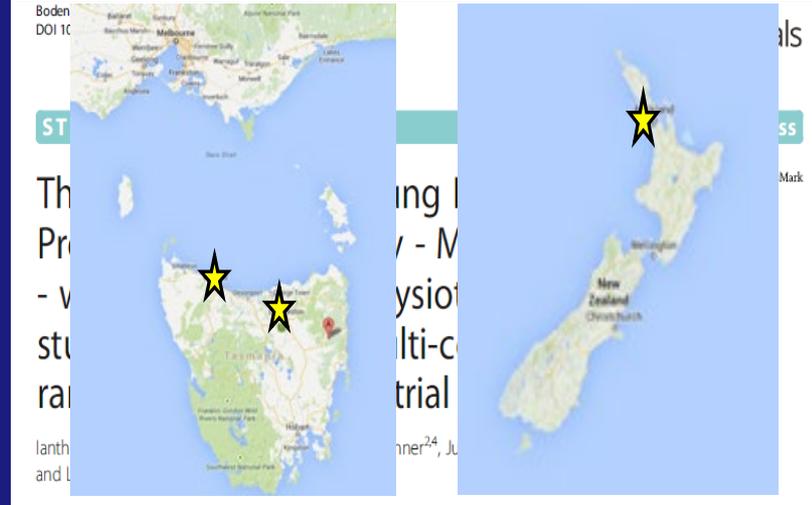
Determine the effect of a **single** pre-operative Physiotherapy education and DB&C training session on the incidence of respiratory complications following major upper abdominal surgery (UAS).

### Design:

Multi-centre, binational, placebo controlled  
Double blinded (assessor and patient)  
Parallel group RCT  
Concealed allocation  
Intention to treat analysis

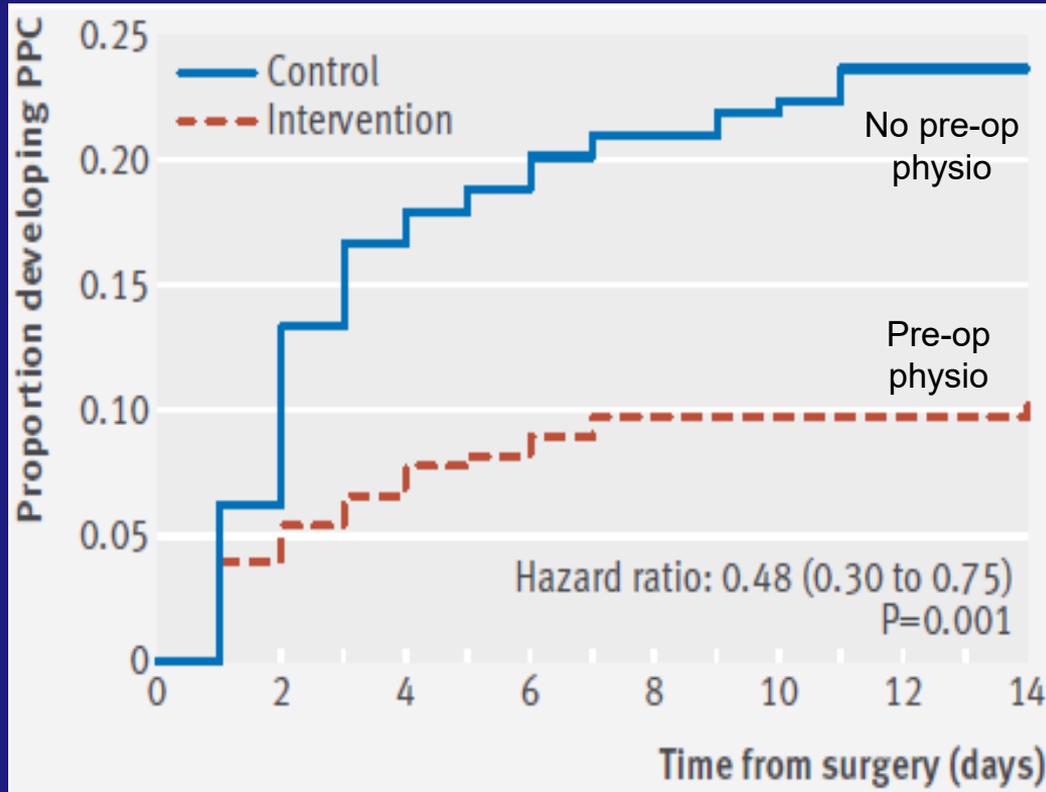
### Inclusions:

Adults  
Elective  
Major UAS  
Minimally invasive  
open incision >5cm



# LIPPSMAck POP trial (Boden 2018 *BMJ*)

Lung Infection Prevention Post Surgery (Major Abdo) with Pre-Operative Physiotherapy



Data adjusted for age, respiratory disease and surgical category

International double blinded multicentre RCT  
n=441

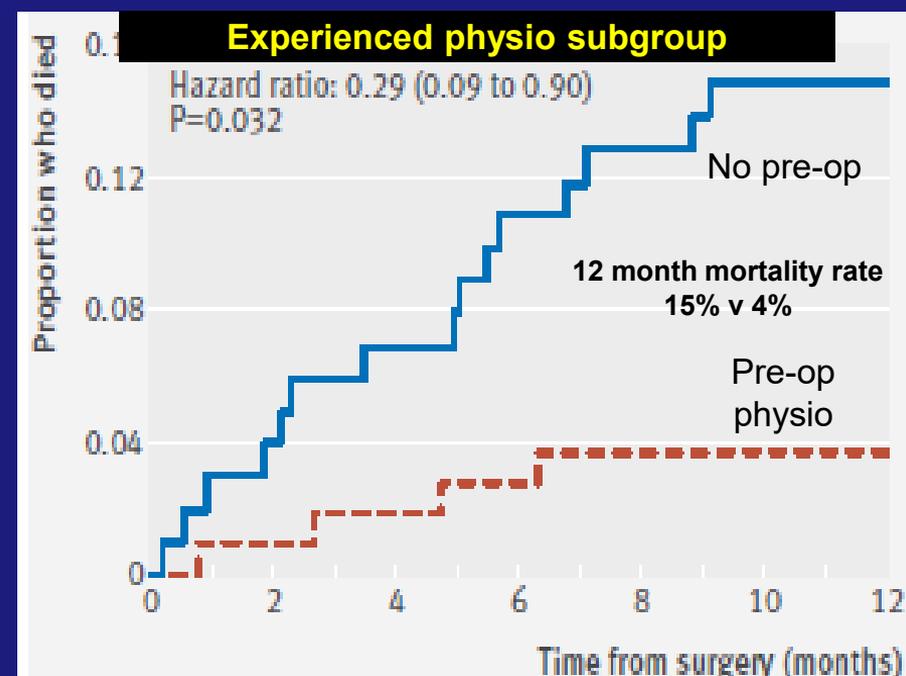
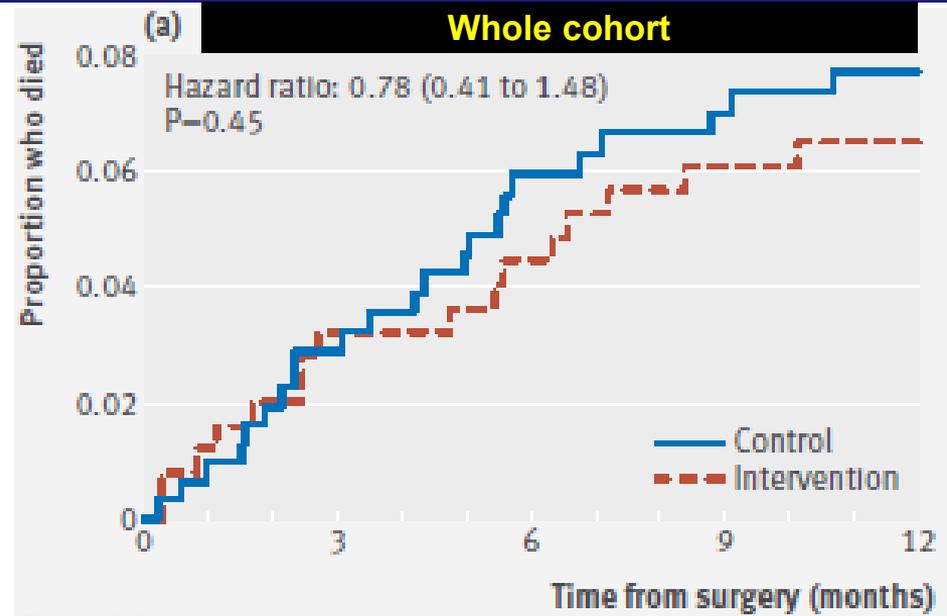
Pre-op physio halved pneumonia rates after major abdominal surgery

**RR 0.48 (0.30 – 0.75), p<0.001**

**NNT = 7 (5 - 14)**

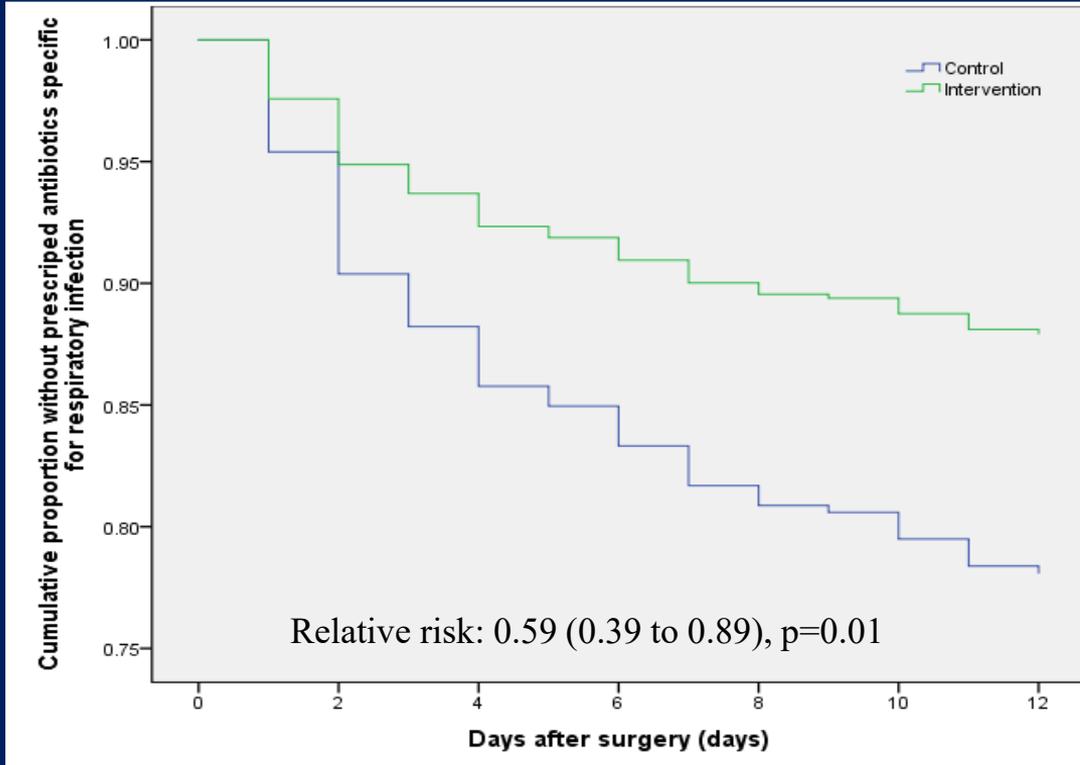
# Mortality risk reduction

## Experience grade of preop physio may matter?



Data adjusted for age, respiratory disease and surgical category

# Prescription of an antibiotics specific for a respiratory infection after surgery



Preoperative  
physiotherapy  
reduced the prescription  
of antibiotics by **40%**

Data are intention-to-treat basis and adjusted for age, respiratory comorbidity, and surgical category.

# Acknowledged as one of the Top 20 trials of all time in physiotherapy

## PEDro Top 5 Trials 2014-2019

---

To celebrate PEDro's 20th birthday we have identified the five most important randomised controlled trials in physiotherapy published in the years 2014-2019. The trials were nominated by PEDro users, and an independent panel of international trialists judged the nominations received.

We are excited to announce the PEDro Top 5 Trials! These ground-breaking trials are from a broad cross-section of physiotherapy practice. The trials answer important clinical questions that will change the way people are treated for a variety of conditions seen by physiotherapists and other healthcare professionals. All of them mark important milestones in the evolution of physiotherapy treatment.

The trials are listed below in no particular order. We have produced short videos to summarise each trial.

[Preoperative physiotherapy for the prevention of respiratory complications after upper abdominal surgery: pragmatic, double blinded, multicentre randomised controlled trial](#)

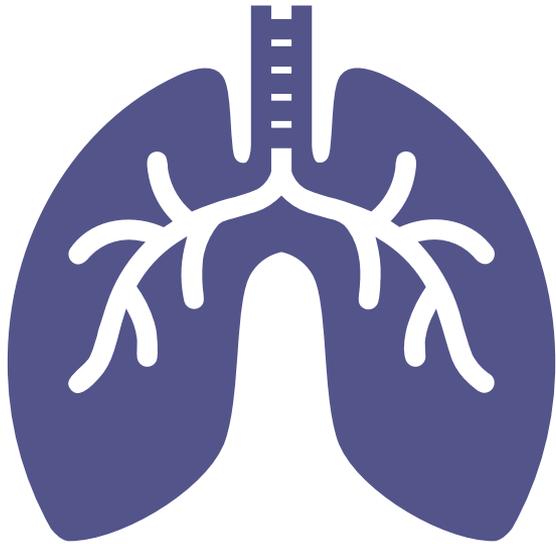
Boden I, Skinner EH, Browning L, Reeve J, Anderson L, Hill C, Robertson IK, Story D, Denehy L  
*BMJ* 2018 Jan 24;360:j5916



**Alright, it works (sigh),  
but changing practice and  
getting a physio into  
preadmission clinics is  
difficult and would cost  
money.**

**Is it worth the time and  
cost?**





Clinical trial phase - cost effectiveness



# Journal of **PHYSIOTHERAPY**

journal homepage: [www.elsevier.com/locate/jphys](http://www.elsevier.com/locate/jphys)

## Research

### Preoperative physiotherapy is cost-effective for preventing pulmonary complications after major abdominal surgery: a health economic analysis of a multicentre randomised trial

Ianthe Boden <sup>a,b</sup>, Iain K Robertson <sup>c</sup>, Amanda Neil <sup>d</sup>, Julie Reeve <sup>e,f</sup>, Andrew J Palmer <sup>g,h</sup>, Elizabeth H Skinner <sup>i,j</sup>, Laura Browning <sup>i,k</sup>, Lesley Anderson <sup>f</sup>, Cat Hill <sup>l</sup>, David Story <sup>m</sup>, Linda Denehy <sup>n,o</sup>

Ianthe Boden & colleagues have won the

**Paper of the Year for 2020**

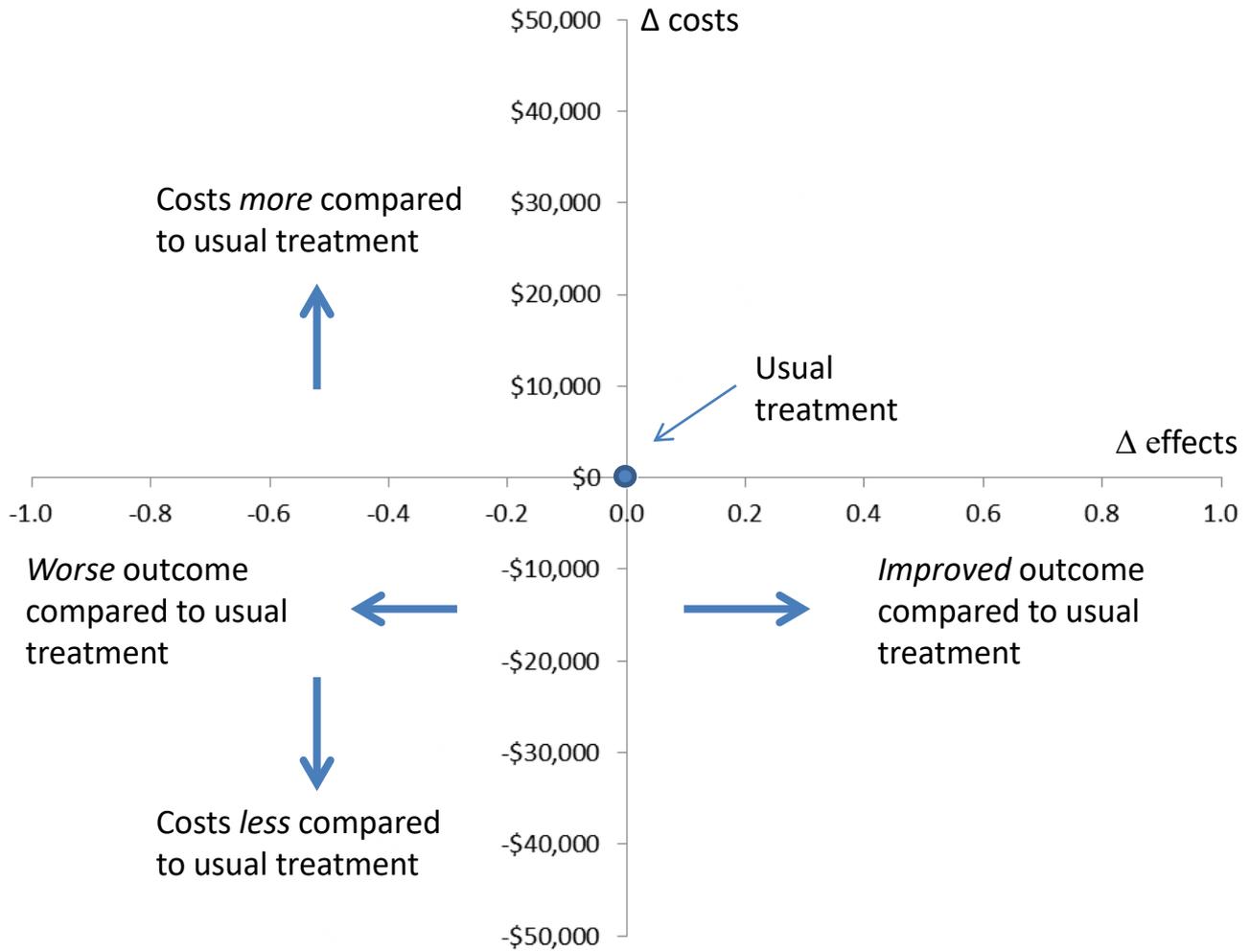
Journal of Physiotherapy 2020;66:180–187.

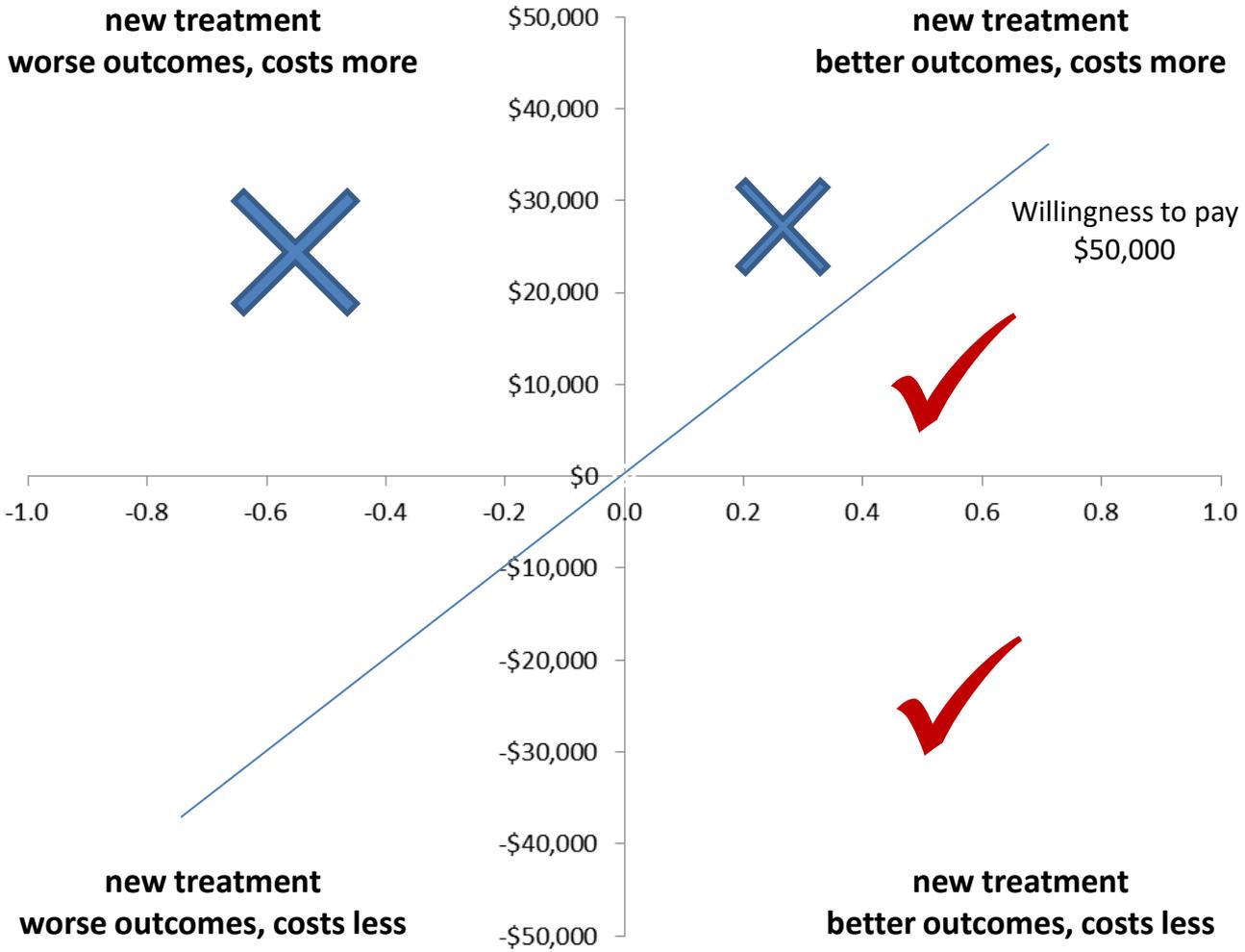
The winning paper is judged by a panel of members of the International Advisory Board.



Parameter	No PPC n=347	PPC n=85	Mean diff (95%CI)	p value*
<b>Costs</b>				
Hospital stay				
ICU/HDU stay	\$2,023 (3,322)	\$13,024 (14,882)	\$11,001 (\$9,283 to \$12,719)	<0.0001
Surgical ward stay	\$12,083 (6,905)	\$22,606 (23,292)	\$10,523 (\$7,665 to \$13,381)	<0.0001
Sub-acute stay	\$438 (3340)	\$2,260 (6,911)	\$1,822 (\$804 to \$2,840)	0.001
Ventilation support				
Mechanical ventilation	\$30 (209)	\$1,793 (4,360)	\$1,763 (\$1,302 to \$2,223)	<0.0001
NIV	\$0 (0)	\$106 (310)	\$106 (\$73 to \$139)	<0.0001
High-flow oxygen	\$5 (34)	\$162 (249)	\$157 (\$130 to \$184)	<0.0001
Standard oxygen	\$49 (43)	\$107 (79)	\$58 (\$46 to \$70)	<0.0001
Pathology tests				
Sputum cultures	\$2 (12)	\$61 (71)	\$59 (\$51 to \$67)	<0.0001
Blood cultures	\$5 (19)	\$64 (106)	\$59 (\$47 to \$71)	<0.0001
All remaining tests	\$810 (721)	\$2,858 (2,949)	\$2,048 (\$1,702 to \$2,394)	<0.0001
Radiology tests				
Chest X-rays	\$68 (105)	\$444 (338)	\$376 (\$334 to \$418)	<0.0001
Chest CT's	\$10 (68)	\$169 (310)	\$159 (\$123 to \$195)	<0.0001
All remaining tests	\$55 (101)	\$335 (539)	\$280 (\$219 to \$341)	<0.0001
Antibiotics				
Respiratory indication	\$24 (144)	\$518 (413)	\$494 (\$441 to \$547)	<0.0001
All other indications	\$151 (301)	\$241 (340)	\$90 (\$558 to \$738)	0.018
Medical visits				
Out of round visits	\$403 (566)	\$1,283 (1353)	\$880 (\$693 to \$1,067)	<0.0001
MET calls	\$43 (242)	\$422 (951)	\$1,240 (\$1,089 to \$1,391)	<0.0001
<b>Total costs</b>				
Total targeted costs model	\$16,200 (10,777)	\$46,274 (42,155)	\$30,074 (\$25,081 to \$35,067)	<0.0001
<b>Sensitivity analysis</b>				
Government episode of care costs	\$25,760 (16,726)	\$56,829 (42,141)	\$31,069 (\$25,380 to \$36,758)	<0.0001

All data mean \$(SD), mean difference \$(95%CI) per patient in 2018 Australian dollars

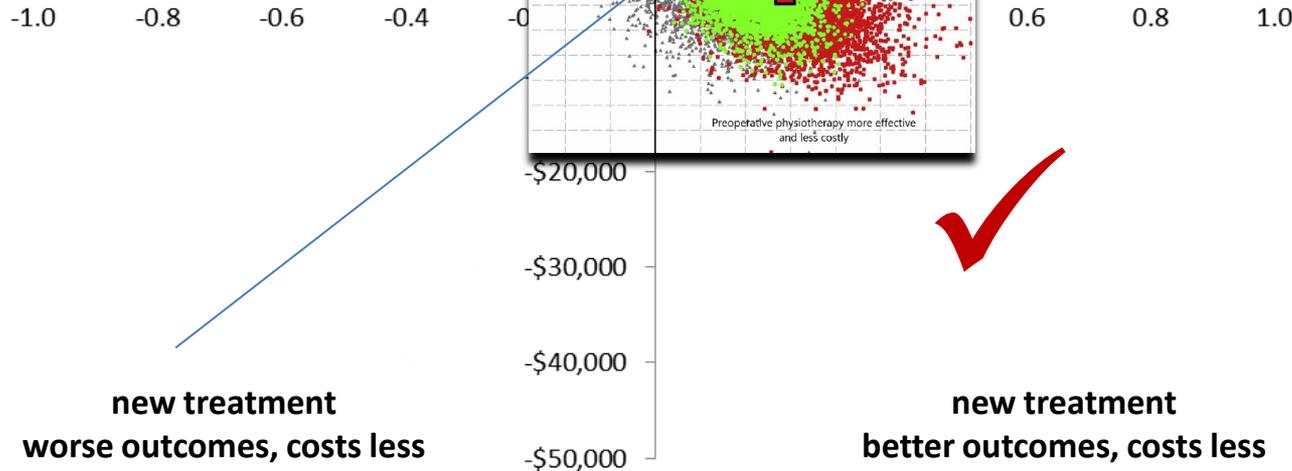




**new treatment  
worse outcomes, costs more**



**new treatment  
better outcomes, costs more**



## **COST EFFECTIVENESS**

Preop physiotherapy  
**saved the hospital  
approximately  
\$460 in downstream  
hospital costs per  
patient.**

**Return on investment:**

Overall  
\$8 saved for every \$ spent

Senior physio  
\$15 saved for every \$ spent

**new treatment  
worse outcomes, costs more**



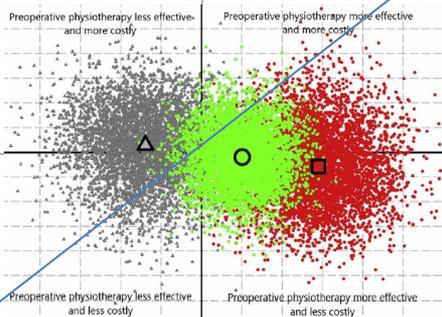
-1.0 -0.8 -0.6 -0.4

\$50,000  
\$40,000  
\$30,000  
\$20,000  
-\$20,000  
-\$30,000  
-\$40,000  
-\$50,000

**new treatment  
better outcomes, costs more**



Willingness to pay  
\$50,000



**new treatment  
worse outcomes, costs less**

**new treatment  
better outcomes, costs less**

**COST  
EFFECTIVENESS TO  
IMPROVE QUALITY  
ADJUSTED LIFE  
YEARS (QALYs)**

**Preop physio improved  
quality adjusted life  
years at an overall cost  
saving for the hospital**

**BUT only if preop  
physio was provided  
by an experienced  
physiotherapist**

- Patients care about not getting pneumonia
- Patients want face-to-face education
- Could benefit a huge worldwide population
- Halves a serious hospital-acquired infection
- Simple
- Single dose intervention
- No harm
- Low-cost (\$50 per patient)
- Best outcomes and cost savings if done by a Senior Physio



OPEN ACCESS

## Preoperative physiotherapy for the prevention of respiratory complications after upper abdominal surgery: pragmatic, double blinded, multicentre randomised controlled trial

Ianthe Boden,<sup>1,2</sup> Elizabeth H Skinner,<sup>2,3</sup> Laura Browning,<sup>2,3</sup> Julie Reeve,<sup>4,5</sup> Lesley Anderson,<sup>5</sup> Cat Hill,<sup>6</sup> Iain K Robertson,<sup>7,8</sup> David Story,<sup>9</sup> Linda Denehy<sup>10,11</sup>

For numbered affiliations see end of article.

Correspondence to: I Boden  
ianthe.boden@rns.tas.gov.au

Additional material is published online only. To view please visit the journal online.

Cite this as: *BMJ* 2018;360:j5916  
<http://dx.doi.org/10.1136/bmj.j5916>

Accepted: 12 December 2017

### ABSTRACT

#### OBJECTIVE

To assess the efficacy of a single preoperative physiotherapy session to reduce postoperative pulmonary complications (PPCs) after upper abdominal surgery.

#### DESIGN

Prospective, pragmatic, multicentre, patient and assessor blinded, parallel group, randomised placebo controlled superiority trial

### MAIN OUTCOME MEASURES

The primary outcome was a PPC within 14 postoperative hospital days assessed daily using the Melbourne group score. Secondary outcomes were hospital acquired pneumonia, length of hospital stay, utilisation of intensive care unit services, and hospital costs. Patient reported health related quality of life, physical function, and post-discharge complications were measured at six weeks, and all cause mortality was measured to 12 months.

**NIHR** | National Institute  
for Health Research

Discover Portal

Home Signals Highlights Themed Reviews Categories Tools

Search



**NIHR Signal** Physiotherapy education before major abdominal surgery reduces lung complications

Published on 3 April 2018

### Expert commentary

Lung related complications are common in patients undergoing major surgery, resulting in longer hospital stays or additional treatments. Pre-operative respiratory physiotherapy (in the form of education, breathing exercises, bed mobility exercises, and encouraging early ambulation) used to be routine, but these visits fell out of practice to focus on post-operative care.

This research found pre-operative physiotherapy was associated with fewer post-operative lung problems. Unfortunately, despite randomisation, there were more patients with higher baseline risk of complications in their



### About this Attention Score

In the top 5% of all research outputs scored by Altmetric

High Attention Score compared to outputs of the same age (99th percentile)

High Attention Score compared to outputs of the same age and source (91st percentile)

# THANK YOU!

