



# Strength After Breast Cancer

Kathryn Schmitz, PhD, MPH, FACSM, FTOS

Professor of Public Health Sciences

Associate Director of Population Sciences

Penn State College of Medicine



**PennState**  
Cancer Institute

NCI R21-CA152451, NCI R01-106854, NCI U54-155850

# WTBS

- RCT on weight training for breast cancer survivors
  - With lymphedema (n=14)
  - At risk for lymphedema (n=71)
- Intervention at UMN University Recreation Center
  - 2 x weekly, 6 months
  - 13 weeks supervised
- Lymphedema outcome
  - Weight training conferred NO RISK of lymphedema onset/worsening (Ahmed et al. JCO 2006)



# PAL Trial

- One year long RCT on weight training for breast cancer survivors
  - With lymphedema (n=141)
  - At risk for lymphedema (n=154)
  - 35% of participants were black women
- Intervention at YMCAs with YMCA staff
  - 2x weekly weight-lifting
    - 3 months supervised
    - 9 months unsupervised
- Training intervention staff
  - 3 days, 24 hours
  - 17 fitness staff trained
  - 8 YMCA Fitness Centers
  - Intervention fidelity monitored



## ONLINE FIRST

## Weight Lifting for Women at Risk for Breast Cancer–Related Lymphedema: A Randomized Trial

Kathryn H. Schmitz, PhD, MPH

Rohana L. Ahmed, MD, PhD

Andrea B. Truett, ScD

Andrea Chevillat, MD, MSCE

Lorita Lewis-Grant, MPH, MSW

Rebecca Smith, MD, MS

Cathy J. Bryan, MEd

Catherine T. Williams-Smith, BS

Jesse Chittams, MS

**M**ORE THAN 2.4 MILLION breast cancer survivors live in the United States.<sup>1</sup> Lymphedema ranks high among their concerns because it causes swelling and discomfort, impairing arm function and quality of life<sup>2,3</sup> and increasing health care costs.<sup>4</sup> Lymphedema remains a frequent complication among survivors, despite lymphatic-sparing procedures such as sentinel lymph node biopsy. Of the 61% of patients who undergo sentinel lymph node biopsy, 3% to 7% develop breast cancer–related lymphedema.<sup>5,6</sup> However, one-third of patients with breast cancer require complete axillary dissection,<sup>7</sup> which is associated with 13% to 47% incident lymphedema.<sup>1,8</sup>

Breast cancer survivors at risk for lymphedema after activity, limit activity, or both from fear and uncertainty about their personal risk level, and upon guidance advising them to avoid lifting children, heavy bags, or other objects with the at-risk arm.<sup>9,10</sup> Such guidance is often interpreted in a manner

**Context** Clinical guidelines for breast cancer survivors without lymphedema advise against upper body exercise, preventing them from obtaining established health benefits of weight lifting.

**Objective** To evaluate lymphedema onset after a 1-year weight lifting intervention vs no exercise (control) among survivors at risk for breast cancer–related lymphedema (BCRL).

**Design, Setting, and Participants** A randomized controlled equivalence trial (Physical Activity and Lymphedema trial) in the Philadelphia metropolitan area of 154 breast cancer survivors 1 to 5 years postunilateral breast cancer, with at least 2 lymph nodes removed and without clinical signs of BCRL at study entry. Participants were recruited between October 1, 2005, and February 2007, with data collection ending in August 2008.

**Intervention** Weight lifting intervention included a gym membership and 13 weeks of supervised instruction, with the remaining 9 months unsupervised, vs no exercise.

**Main Outcome Measures** Incident BCRL determined by increased arm swelling during 12 months ( $\geq 5\%$  increase in interlimb difference). Clinician-defined BCRL onset was also evaluated. Equivalence margin was defined as doubling of lymphedema incidence.

**Results** A total of 134 participants completed follow-up measures at 1 year. The proportion of women who experienced incident BCRL onset was 11% (8 of 72) in the weight lifting intervention group and 17% (13 of 75) in the control group (cumulative incidence difference [CID],  $-6.0\%$ ; 95% confidence interval [CI],  $-17.2\%$  to  $5.2\%$ ;  $P$  for equivalence = .04). Among women with 5 or more lymph nodes removed, the proportion who experienced incident BCRL onset was 7% (3 of 45) in the weight lifting intervention group and 22% (11 of 49) in the control group (CID,  $-15.0\%$ ; 95% CI,  $-18.6\%$  to  $-11.4\%$ ;  $P$  for equivalence = .003). Clinician-defined BCRL onset occurred in 1 woman in the weight lifting intervention group and 3 women in the control group (1.5% vs 4.4%;  $P$  for equivalence = .12).

**Conclusion** In breast cancer survivors at risk for lymphedema, a program of slowly progressive weight lifting compared with no exercise did not result in increased incidence of lymphedema.

**Trial Registration** clinicaltrials.gov identifier: NCT00194363

JAMA. Published online December 8, 2010; doi:10.1001/jama.2010.1837 www.jama.com

**Author Affiliations:** Center for Clinical Epidemiology and Biostatistics, University of Pennsylvania School of Medicine and Abramson Cancer Center, Philadelphia (Dr Schmitz and Truett) and Miss Lewis-Grant, Bryan, and Williams-Smith and Mr Chittams, Department of Epidemiology, University of Minnesota Medical School, Minneapolis (Dr Ahmed); Physical Medicine and Rehabilitation, Mayo Clinic, Rochester,

Minnesota (Dr Chevillat); and Department of Physical Medicine and Rehabilitation, University of Pennsylvania School of Medicine, Philadelphia (Dr Chittams and Smith).

**Corresponding Author:** Kathryn H. Schmitz, PhD, MPH, University of Pennsylvania School of Medicine, 303 Rockley Hall, 423 Gaudin Dr, Philadelphia, PA 19104-6021 (schmitz@mail.med.upenn.edu).



**Changes in th  
a one-year st  
with or at ris**

Rebecca M. Speck · C  
Rehana L. Ahmed · I  
Kathryn H. Schmitz

Lymphology 43 (2010) 1-13

## **IMPACT OF LYMPHEDEMA AND ARM SYMPTOMS ON QUALITY OF LIFE IN BREAST CANCER SURVIVORS**

J.M. Hormes, C. Bryan, L.A. Lytle, C.R. Gross, R.L. Ahmed,

J Cancer Surviv (2014) 8:260–268  
DOI 10.1007/s11764-013-0337-z

Depart  
of Epid  
CRG),  
Center  
Epidem

## **Influence of weight training on skeletal health of breast cancer**

Published Ahead of Print on May 11, 2015 as 10.1200/JCO.2014.57.7395  
The latest version is at <http://jco.ascopubs.org/cgi/doi/10.1200/JCO.2014.57.7395>

JOURNAL OF CLINICAL ONCOLOGY

O R I G I N A L R E P O R T

## **Weight Lifting and Physical Function Among Survivors of Breast Cancer: A Post Hoc Analysis of a Randomized Controlled Trial**

*Justin C. Brown and Kathryn H. Schmitz*



# Summary of Findings

- Risk of lymphedema flare-ups decreased by HALF (Schmitz et al. NEJM 2009)
  - Cost effectiveness?
- Among at-risk women with 5+ nodes removed, risk of ↑ arm swelling is reduced by 70% (Schmitz et al. JAMA 2010)
- Significant improvements in upper body symptoms (ibid)
- Substantive strength improvements (ibid)
- Prevented declines in physical function (Brown et al. 2015 JCO)
- Body image improved as well (Speck et al. 2010 Br Cancer Res Treat)



# Ensuring Safety of Participants

- Telephone pre-screening for eligibility
- Hour long educational lecture for all participants

Who would do this outside of the realm of a research study? There is no infrastructure for this within clinical setting OR fitness centers.

- Measurement staff
- Obvious centralized system for referring women back to FREE PT evaluation and treatment



# Revised Intervention: Strength After Breast Cancer

- Referral from Oncology clinician
- Evaluation with a PT
- Education session
- 4 group PT sessions to learn the protocol
- Choice:
  - Home equipment
  - YMCA membership
- Choice of self-pay or insurance co-pay

# Trainings

- Oncology clinicians
  - Set up automated EMR script
- Physical Therapists
  - 2-6 hour training
    - Education session
    - Evaluations
    - Group exercise sessions



# Safety and effectiveness: SABC vs. PAL

|                                 | Strength After Breast Cancer Effectiveness Trial |           |       | Physical Activity after Lymphedema Efficacy Trial (5, 6) |            |       |
|---------------------------------|--------------------------------------------------|-----------|-------|----------------------------------------------------------|------------|-------|
|                                 | Baseline                                         | 12-month  | P     | Baseline                                                 | 12-month   | P     |
| Lymphedema                      |                                                  |           |       |                                                          |            |       |
| Number of lymphedema events     |                                                  |           | .002  | 3.3±3.2                                                  | 2.2±2.6    | <.001 |
| Severity of lymphedema          |                                                  |           | .058  | 2.0±0.7                                                  | 1.6±0.7    | <.001 |
| Time to next lymphedema event   |                                                  |           |       | 22±12.40                                                 | 6.84±11.66 | .40   |
| Lymphedema flare-up             |                                                  |           |       |                                                          |            |       |
| New lymphedema                  |                                                  |           |       |                                                          |            | —     |
| Flare-up of existing lymphedema |                                                  |           |       |                                                          |            |       |
| Muscular Strength Outcomes      |                                                  |           |       |                                                          |            |       |
| Bench press (lbs)               | 45±11                                            |           |       |                                                          |            |       |
| Leg press (lbs)                 | 190±58                                           | 200±58    |       |                                                          |            |       |
| Body Image and Relationships    |                                                  |           |       |                                                          |            |       |
| Strength and health             | 34.2±9.2                                         | 28.7±9.3  | <.001 |                                                          |            |       |
| Social barriers                 | 19.8±7.0                                         | 17.0±6.3  | .003  | 16.6±6.3                                                 |            | .01   |
| Appearance and sexuality        | 30.8±6.7                                         | 27.7±7.2  | <.001 | 30.0±8.0                                                 | 27.0±7.2   | .001  |
| Total score                     | 85.8±19.9                                        | 74.0±20.3 | <.001 | 81.2±20.2                                                | 70.0±19.1  | <.001 |



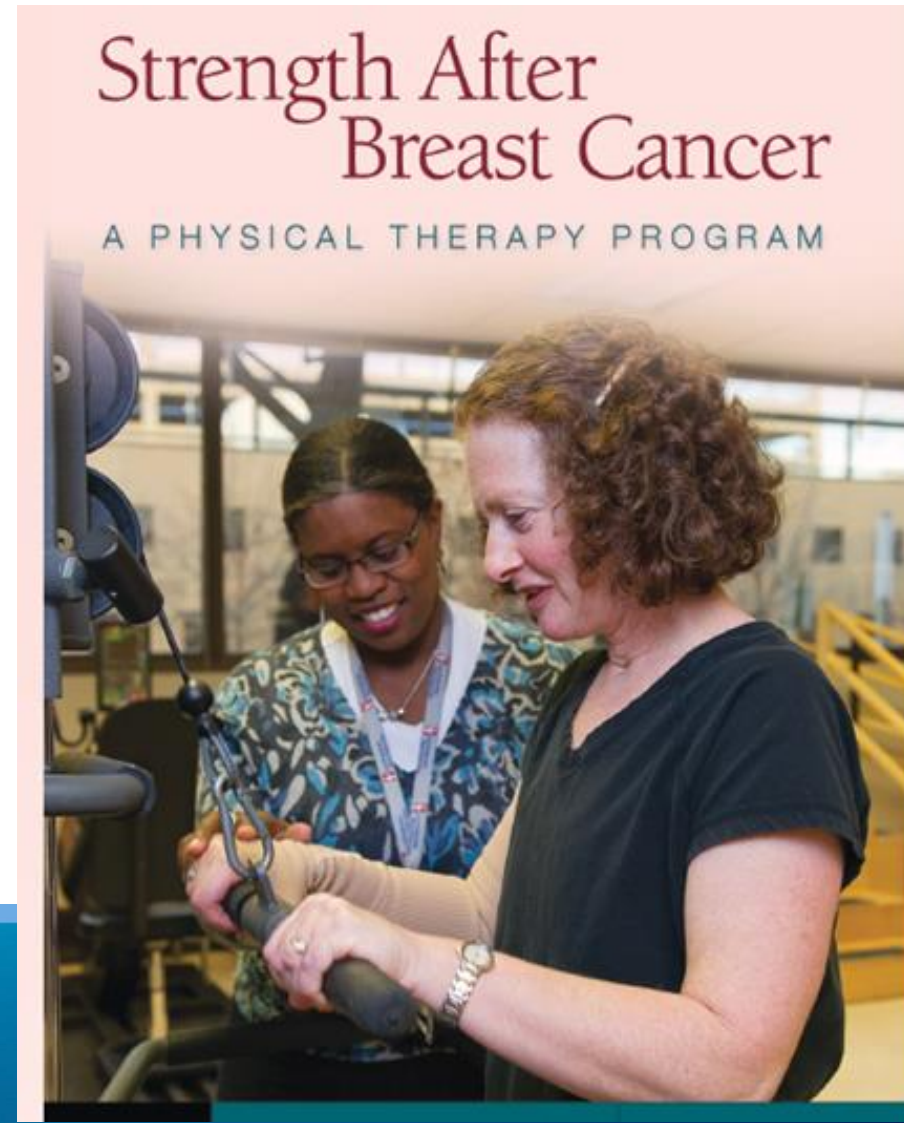
# Qualitative Evaluation of Implementation (CFIR)

- Intervention characteristics
  - Group PT does not work – changed to individual PT
- Outer Setting
  - Patients don't view exercise like medicine
  - Cost & location are major issues
    - insurance coverage vital
- Inner Setting
  - Clinicians had difficulty finding time to make referrals
  - Confusion regarding referral process
  - Active follow-up from PT clinic was crucial
- Implementation approach
  - Champions are crucial



# PAL is now a clinical program called Strength ABCs

- Paid for by
  - Private insurance
  - Medicare and Medicaid
- Available @ multiple locations



**PennState**  
Cancer Institute



## After Referral to Outpatient Rehabilitation

**Visit 1**  
PT Evaluation  
And Clearance

**Visit 2**  
Lymphedema  
Education  
Session

**Visit 3**  
Teach Warm-up,  
cool down, teach  
2-3 exercises

**Visit 4**  
Have pt repeat  
Visit 3 activities,  
answer questions,  
teach 2-3  
exercises

**Visit 5**  
Have pt repeat  
visit 4 activities,  
answer  
questions, teach  
2-3 exercises

**Visit 6**  
**Discharge Day**  
Pt. demonstrates  
complete  
protocol.

Discharge may only occur  
when the pt demonstrates  
understanding of:

1. Good form with exercises
2. Progression
3. Deconditioning
4. Overall arm work
5. Monitoring symptoms
6. When to call for a follow-up appt

**Additional visits will be  
scheduled for pts not ready  
for discharge at visit 6.**

Visit 1

Visit 2

Visit 3

Visit 4

Visit 5

Visit 6

Week

0

1

2

3

4

5

6

7

8

9

10

11

12

13

14

15

**Home  
Exercise**

**2x weekly**  
Practice  
warm-up, cool  
down, and 2-3  
exercises until  
visit 4

**Home  
Exercise**

**2x weekly**  
Practice  
warm-up, cool  
down, and 5-6  
exercises until  
visit 5

**Home  
Exercise**

**2x weekly**  
Practice  
warm-up, cool  
down, and 8-  
10 exercises  
until visit 6

**Home  
Exercise**

**2x weekly**  
Full protocol,  
on an ongoing  
basis,  
monitoring for  
symptom  
changes



Home Exercise Continues 2x weekly  
Patient calls PT for evaluation upon noticing any  
change in symptoms that lasts a week or longer

Resistance delivered to home or purchased by patient.



Cancer Institute

# Training for Strength ABCs now online

- Partnership with Klose Training and Consulting
- 387 have purchased the training!
- \$125 for 4 hour training



**PennState**  
Cancer Institute

# Future Directions

- D&I research to compare (R01 CA221288-01 pending IRG review)
  - Strength ABCs
  - Strength and Courage DVD
- Exercise Medicine Unit at PSCI
  - ENACT trial
    - D&I research on exercise during chemotherapy





# Thank you!

Questions?



**PennState**  
Cancer Institute

# Acknowledgements

- Key Collaborators

- Andrea Troxel
- Andrea Cheville
- J. Sanford Schwartz
- Lewis Chodosh
- Rehana Ahmed
- Rebecca Speck
- Karen Glanz
- David Sarwer
- Linda Jacobs
- Julia Tchou
- Rex Ahima
- Bryan Spinelli
- Joy Cohn
- Andrea Branas
- Fran Barg
- Sandi Hayes



- Schmitz Lab trainees & staff

- Lorita Grant
- Justin Brown
- Monica Laudermilk
- Shannon Lynch
- Cathy Bryan
- Amy Rogerino
- Renata Alford
- Zi Zhang
- Margaret Evangelista
- Domenick Salvatore
- Laura DiGiovanni
- Katie Sturgeon
- Jonathan Mitchell
- Jerene Good
- Venetia Lambert

- PA and NJ Cancer Registries
- Penn Therapy and Fitness
- Funders
  - NCI, Komen, UMN GCRC, Penn CTSA
- PARTICIPANTS!

