




First-Time Low Back Pain and Recurrent Low Back Pain: Recognition of Key Factors and Prevention



Chad Cook PT, PhD, MBA, FAAOMPT
Walsh University
Adam Payne Goode PT, PhD
Duke University





Primary, Secondary, Tertiary, and Quaternary Prevention

Chad Cook PhD, PT, MBA, FAAOMPT
Professor and Chair
Walsh University

Preventative Management of Low Back Pain

Level	Definition
Primary prevention	Methods to <i>avoid occurrence</i> of disease. Most population-based health promotion efforts are of this type.
Secondary prevention	Methods to diagnose and treat existent disease in early stages before it causes significant morbidity (<i>stopping the progression of disease-oriented deterioration</i>)
Tertiary prevention	Methods to reduce negative impact of extant disease by restoring function and reducing disease-related complications. (<i>returning of a patient to a status of maximum usefulness with a minimum risk of recurrence of the disorder</i>)
Quaternary prevention	Methods to mitigate or <i>avoid results of unnecessary or excessive interventions</i> in the health system.

Primary Prevention

Legend
1a + = RCT +
IE = Inadequate

- Never getting LBP in the first place

Lifestyle interventions		Aims of intervention	
		Symptom	Activity and participation
Fitness programmes	At risk	1a +	1a +
	Acute	1a +	1a +
	Chronic	1a +	1a +
Education programmes (interactive)	At risk	IE	IE
	Acute	IE	IE
	Chronic	II+–III	1a +
Advise to stay active (directive)	Acute	1a +	1a +

The ICF category of function and structure is only represented by symptom. Tissue damage is not listed in this table, because it is excluded, by definition, in non-specific low back pain.


Krismer and van Tulder. Best Practice & Research Clinical Rheumatology. Vol. 21, No. 1, pp. 77e91, 2007

Prevention

- *Only exercises appear to have a small effect*
 - Bigos SJ et al. High-quality controlled trials on preventing episodes of back problems: systematic literature review in working-age adults. *Spine J* 2009; 9: 147–68.
 - Choi BK et al. Exercises for prevention of recurrences of low back pain. *Cochrane Database Syst Rev* 2010;1: CD006555.
- *Others have found that Brief psychosocial education was more effective than core exercises*
 - George et al. *BMC Medicine* 2011, 9:128
<http://www.biomedcentral.com/1741-7015/9/128>

Secondary Prevention

- Stopping the progression of disease-oriented deterioration
- Chronic Symptoms?
- *Lasting for a long period of time or marked by frequent recurrence; a defined pattern of behavior*



Secondary Prevention

- In the general population, estimated to be 5.9% to 11.1%
 - Juniper et al. The epidemiology, economic burden, and pharmacological treatment of chronic low back pain in France, Germany, Italy, Spain and the UK: a literature-based review. *Expert Opin Pharmacother* 2009;10:2581–92.
- 3–10% of patients develop persisting LBP (progression to chronicity)
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- 13% experienced chronic pain at 6 months and 19% at 2 years.
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Another Problem?

- Total direct medical costs were estimated at \$8386 ± \$17,507 in the CLBP group



Gore et al. The burden of chronic low back pain: clinical comorbidities, treatment patterns, and health care costs in usual care settings. *Spine*. 2012 May 15;37(11):E668-77.

Tertiary Prevention

- Returning of a patient to a status of maximum usefulness with a minimum risk of recurrence of the disorder
- Recurrence?
- Another episode of the *same condition* during a defined time point

The Evidence

- There was moderate quality evidence that post-treatment exercises can reduce both the rate and the number of recurrences of back pain. However, the results of exercise treatment studies were conflicting.

Choi BK et al. Exercises for prevention of recurrences of low back pain. *Cochrane Database Syst Rev* 2010;1: CD006555.

- Exercise are recommended only for chronic low back pain

Summary of Common Recommendations for Treatment of Low back pain

Acute or Subacute Pain

- * Reassure patients (favourable prognosis).
- * Advise to stay active.
- * Prescribe medication if necessary (preferably time-contingent): first line is paracetamol; second line is nonsteroidal antiinflammatory drugs, consider muscle relaxants, opioids or antidepressant and anticonvulsive medication (as co-medication for pain relief).
- * Discourage bed rest.
- * Do not advise a supervised exercise programme.

Chronic Pain

- * Discourage use of modalities (such as ultrasound, electrotherapy)
- * Short-term use of medication/manipulation
- * Supervised exercise therapy
- * Cognitive behavioural therapy
- * Multidisciplinary treatment

Koes et al. *Eur Spine J*. 2010 Dec;19(12):2075-94.

Wait a minute.....

- Recurrence rates after a single episode of back pain are staggeringly high, with 60 to 86% of patients reporting recurrent back pain symptoms. [Berquist-Ullman et al., *Spine* (2001) 26 (11): E243-E248]
- Guidelines do not support exercise in acute stages. Something doesn't add up.....

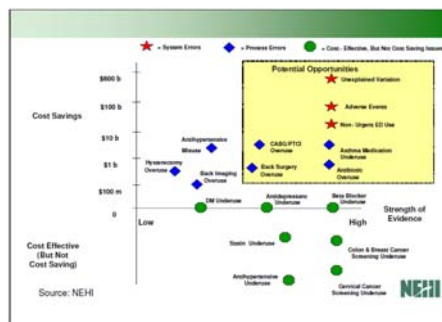


Quaternary Prevention

- Methods to mitigate or *avoid results of unnecessary or excessive interventions* in the health system
- In other words, *not spending money and effort on things that don't work*

• Isaacs DM, Marinac J, Sun C. 2004. Radiograph Use in Low Back Pain: A United States Emergency Department Database Analysis. *Journal of Emergency Medicine*. 26:37-45.
 • Weiner AL, MacKenzie RS. 1999. Utilization of Lumbosacral Spine Radiographs for the Evaluation of Low Back Pain in the Emergency Department. *Journal of Emergency Medicine*. 17:229-33.

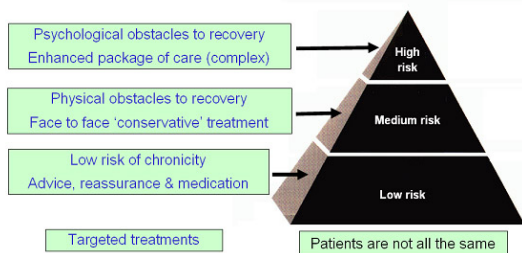
Unnecessary Imaging



Source: New England Healthcare System Institute http://media.washingtonpost.com/wp-srv/nation/pdf/healthreport_092909.pdf

Quaternary Prevention

Concept of subgroup & targeting for primary care low back pain



Why so Bad?

- Guidelines are reactive, not preventative
- He interests of healthcare providers may outweigh what is truly needed
- Maybe we haven't defined the best preventative components yet?



Results of the Systematic Reviews

Chad Cook PT, PhD, MBA, FAAOMPT
Professor and Chair
Walsh University

Risk Factors for First Time Incidence Low Back Pain



Risk Factors for First Time Incidence LBP

- *Primary Purpose:* to analyze individual, physical, and psychosocial risk factors in adult community-dwelling and occupational populations that are predictive of first-time LBP.
- *Secondary Purpose:* to meta-analyze the incidence estimates of new LBP within these longitudinal studies to provide an updated estimate of LBP incidence.
- *Primary, Tertiary Findings*

Population

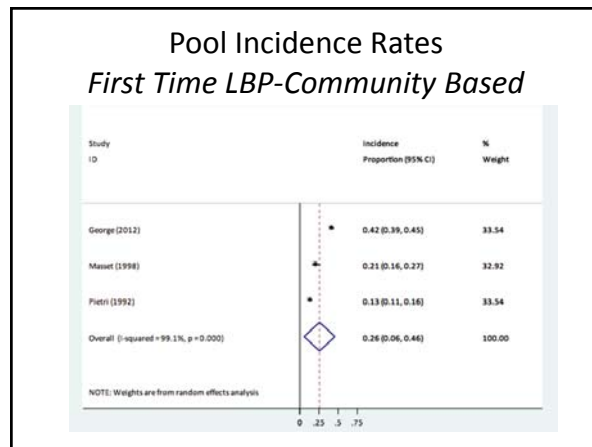
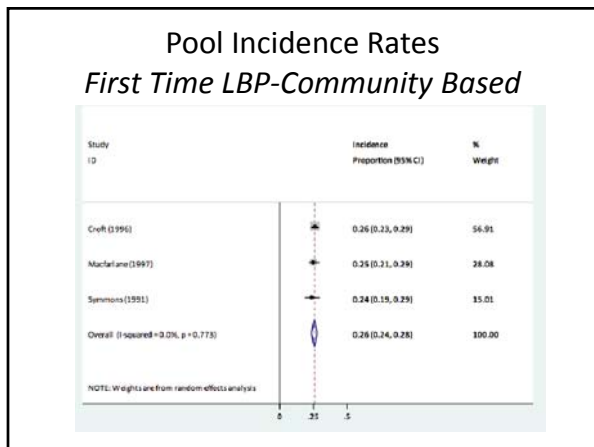
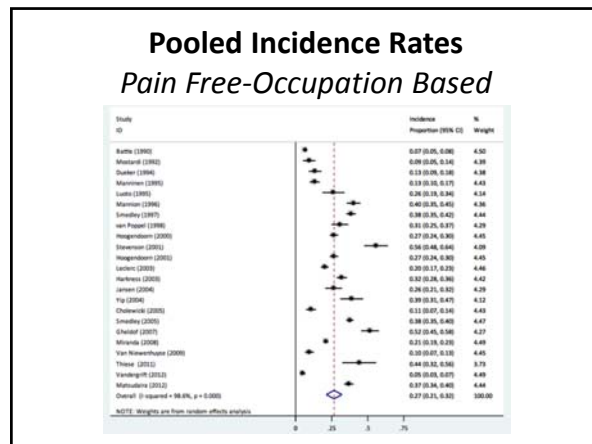
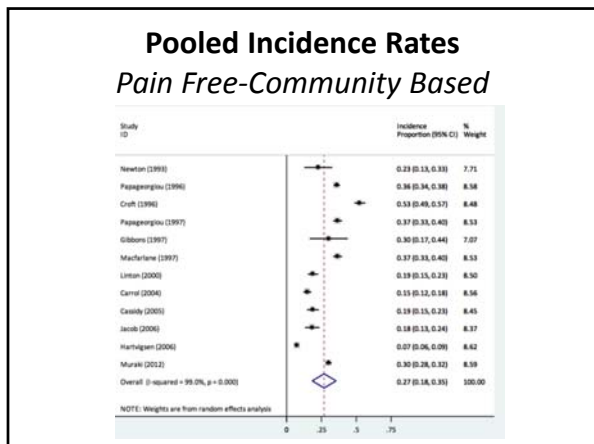
- 2 separate operational definitions of first time LBP;
 - 1) those with subjects at baseline who had never experienced LBP,
 - 2) those that were reported as pain-free at baseline (or, if never experienced LBP was not well reported).
 Further sub-division occurred for population of focus and studies that examined
 - a) community-dwelling populations were separated from studies of
 - b) occupational populations.

Risk Factors

- Baseline to follow up of at least 6 months.
- At baseline, subjects were required to be 18 years of age or older.
- Both physical and psychosocial risk factors were considered for inclusion in this review.
- Studies were excluded if they failed to report odds ratios/risk ratios/hazard ratios for risk factors.

Results LBP

- 41 studies
- 27,589 total individuals in the 39 unique datasets
- Follow up was 6 months to 12 years
- LBP was defined very differently
- Incidence ranged from 5% to 55.8%
- There were only 6 studies in which no LBP ever was the inclusion



- ### Most Robust Risk Factors (PF at Baseline Comm) (only include OR, RR, or HR >2.0)
- Other MSK complaints
 - Standing or walking > 2 hours per day
 - Lifting or moving 25lbs
 - Sit for 2 hours
 - Strength <50%
 - Depression
 - Perceived inadequacy of income/job dissatisfaction
- Odds ratio is the ratio of the odds of an event occurring in one group to the odds of it occurring in a comparison group (people without sciatica).
 ---Relative risk is the ratio of the incidence rate among individuals with a given risk factor to the incidence rate among those without it
 ---Hazard ratio represents the rate per unit time that something happens in comparison to the other condition

- ### Most Robust Risk Factors (PF at Baseline Occup) (only include OR, RR, or HR >2.0)
- Obesity
 - Poor Health
 - Prior LBP
 - Poor Back Endurance
 - Lifting or carrying >25 pounds
 - Manual Jobs
 - Moving patients
 - Awkward posture
 - Mental distress
 - Poor relationships at work

Most Robust Risk Factors (First Ever LBP at Baseline Comm) (only include OR, RR, or HR >2.0)

- Standing or walking >2 hours a day
- Moving objects that weigh >25lbs
- Widespread pain
- Limping
- Higher general health scores

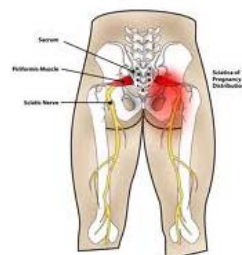
Most Robust Risk Factors (First Ever LBP at Baseline Occ) (only include OR, RR, or HR >2.0)

- Being a woman
- Obesity
- Increased driving time
- Slower velocity doing activities
- Perception of heavy lifting requirements
- Lousy MCS SF-12 scores

Conclusions

- We look for mediators for risk factor assessment
- The following factors, which were investigated in numerous studies cannot be changed
 - Gender (mostly)
 - Previous low back pain

Risk Factors for First Time Incidence Sciatica



Risk Factors for First Time Incidence Sciatica

- *Purpose:* to review studies that examined risk factors associated with sciatica in a healthy population followed longitudinally.
- *Population:* We defined healthy as either: a) no prior history of sciatica, or b) transition from a pain-free state to sciatica.
- *Primary, Tertiary Findings*

Risk Factors

- Baseline to follow up of any timeframe.
- At baseline, subjects were required to be 14 years of age or older.
- Both physical and psychosocial risk factors were considered for inclusion in this review.
- Studies were excluded if they failed to report odds ratios/risk ratios/hazard ratios for risk factors.

Results Sciatica

- 8 studies
- 75,707 total individuals in the 7 unique datasets
- Follow up was 1 to 12 years
- Sciatica was defined very differently
- Incidence ranged from 0.65% to 36%
- Nearly all were Finnish Studies

Most Robust Risk Factors

- | | |
|-------------------------|---------------------|
| • Smoking and Ex-smoker | • OR 1.5 to 13.1 |
| • Obesity (women) | • OR 1.4 to HR 7.1 |
| • Older age (>40years) | • OR 2.4 to RR 12.1 |
| • Previous LBP | • OR 1.5 to 2.9 |
| • Manual labor | • OR 1.3 to 2.6 |
| • Driving >2 hours | • OR 2.1 to 2.7 |

--Odds ratio is the ratio of the odds of an event occurring in one group to the odds of it occurring in a comparison group (people without sciatica).
 ---Relative risk is the ratio of the incidence rate among individuals with a given risk factor to the incidence rate among those without it
 ---Hazard ratio represents the rate per unit time that something happens in comparison to the other condition

Conclusions

- We look for mediators for risk factor assessment
- The following factors, which were investigated in numerous studies cannot be changed
 - Age
 - Previous low back pain



Take Home Message

- The larger the trial and the lesser the risk of bias the less robust the risk factor values were
- Few studies investigated the same things
- Identifying risk factors for primary and tertiary prevention of low back pain is not straight forward



We need a stronger study (s)



Pooling the Review Findings Thus Far

Chad Cook PT, PhD, FAAOMPT
Professor and Chair
Walsh University

Moderators vs. Mediators

- *Moderator variables* change the strength of an effect or relationship between two variables, but can't be modified themselves (e.g., age, gender).
- *Mediator variables* describe the process that occurs to create the relationship between two variables, and as such are always dynamic changeable properties of individuals (e.g., emotions, beliefs, behaviors).

Change the Mediator!

- Change the mediator and you can change the outcome!



Consider History

- ... "limited evidence ...that exercises to strengthen back or abdominal muscles and to improve overall fitness can decrease the incidence and duration of low back pain episodes."
- "minimal evidence to support the use of educational strategies to prevent low back pain"
- There is no evidence supporting risk factor modification for preventing low back pain (smoking cessation and weight loss), there are other reasons to recommend the interventions.



Lahad et al. The effectiveness of four interventions for the prevention of low back pain. 1994 Oct 26;272(16):1286-91.

Our *Most Robust* Risk Factors Mediators

- History of Low Back Pain
- Don't smoke or quit smoking
- Improving Overall Health Behaviors
- Improving Low Back Endurance
- Improving Strength
- Improving one's functional status
- Improving ergonomics
- Depression

Never Get LBP in the First Place

because circular reasoning works



Don't Smoke or Quit Smoking (Sciatica only)



Health Behaviors


- Sum of Smoking, overweight, and lack of physical exercise



Miranda H, Viikari-Juntura E, Punnett L, Riihimaki H. Occupational loading, health behavior and sleep disturbance as predictors of low-back pain. *Scand J Work Environ Health* 2008;34(6):411-9.

Improving Endurance

- 126 persons who were free from back complaints at entry, 33 developed low-back pain during a follow-up of 1 year.
- Adjusted for age, sex, and occupation, the odds ratio of a new low-back pain in those with poor performance was **3.4 (95% confidence interval, 1.2-10.0)** compared to those with medium or good performance.




	Men	Women
Low risk	104-240 sec	110-240 sec
Medium risk	58-104 sec	58-110 sec
High risk	<58 sec	

Alaranta et al. Static back endurance and the risk of low-back pain. *Clin Biomech.* 1995 Sep;10(6):323-324.

Improving Strength of Quads

- The subject held 50% of maximal contraction to fatigue. Visual feedback and encouragement were given. When force output fell below 40% of maximal effort, the test was terminated and the time was recorded.



Grip Strength


- Smedley dynamometer
- Higher strength is a protective factor by 2.0 times



Hartvigsen J, Frederiksen H, Christensen K. Physical and mental function and incident low back pain in seniors: a population-based two-year prospective study of 1387 Danish Twins aged 70 to 100 years. *Spine (Phila Pa 1976)* 2006;31(14):1628-32.

Improving Function

- Primarily for older people
- Measured with the HAQ



Ergonomics



- Standing
- Sitting (protective)
- Twisting
- Awkward postures
- Moving patients in bed



Depression

- *More studies suggest no relationship*
- Few independent psychosocial risk factors have been demonstrated to exist. Randomized clinical trials aimed at modifying these factors have shown little impact on patient prognosis. Qualitative research might be valuable to explore further the field of LBP and to define new management strategies.

Ramond et al. Psychosocial risk factors for chronic low back pain in primary care— a systematic review. *Fam Pract.* 2011 Feb;28(1):12-21.

Robustness of These?



- *Not very impressive.....*
- Low OR's/RR's
- Not Always significant across all studies
- Limited value in prevention studies

Slide 14

CC1 Chad Cook, 12/11/2012

What is low back pain and why does it matter?

Adam P. Goode, PT, DPT, PhD
Assistant Professor
Duke University

Low back pain

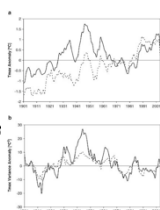
- A common musculoskeletal condition
- How common?
 - Second to the common cold
- 80% of Americans experience an episode in a lifetime



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How Common

- Highly variable
- Prevalence
 - 1 year prevalence between 22% - 65%
 - Lifetime 11% to 84%
- General population incidence
 - 8% to 54%



<http://www.google.com/imgres?imgurl=http://www.kennedykrieger.edu/medimages/00000022.jpg&imgref=http://www.kennedykrieger.edu/medimages/00000022.jpg&imgref=http://www.kennedykrieger.edu/medimages/00000022.jpg&imgref=http://www.kennedykrieger.edu/medimages/00000022.jpg&imgref=http://www.kennedykrieger.edu/medimages/00000022.jpg&imgref=http://www.kennedykrieger.edu/medimages/00000022.jpg&imgref=http://www.kennedykrieger.edu/medimages/00000022.jpg>

Defining LBP

- Cross-sectional Guidance
 - Frequency of symptoms
 - Duration of symptoms
 - Severity of symptoms
 - Location of symptoms

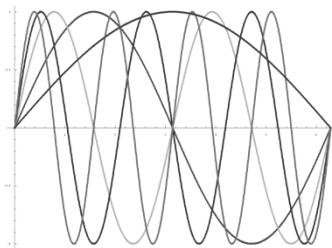
Standardization of LBP. Spine 2008. (Dionne, Dunn, Croft et al. 2008)

Time Frame

- Recommended time frame
- 4 weeks
 - Due to validity of recall of symptoms <3 months

Frequency

- On some days
- On most days
- Every day




Duration of Symptoms

- A whole month without any LBP
 - Less than 3 months
 - 3 months or more but <7 months
 - 7 months or more but less than 3 years
 - 3 or more years

Severity

- 10=“Worst Pain Imaginable”
- 9
- 8
- 7
- 6
- 5
- 4
- 3
- 2
- 1
- 0=“No Pain”



SEVERITY — — IMPACT

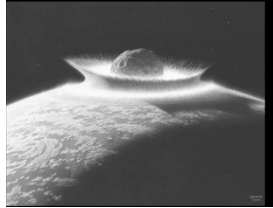
<http://wpdictionary.com/severity>

Still yet

- Acute vs. Chronic
 - Is it just a duration?
 - Acute = < 3 months
 - Chronic >= 3 months
- Some say 6 months or 3 years (von Korff)
- Some say time (3 months) and depression
- Others time (3 months) and activity limitation (Carey 1995, Freburger 2009)

Impact

- What is the impact of LBP on
 - Quality of Life
 - Work
 - Healthcare Expenditures



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Impact of LBP

- Second most common cause of disability among adults in the US (CDC, JAMA, 2001)
- Common cause of care seeking to a provider



<http://www.google.com/imgres?imgref=blue>
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Impact on Work

- Lost Work
 - 149 million days for work per year
- \$100 to \$200 billion annually, two thirds are lost wages and productivity



The course of LBP

- Most Individuals (95%) acute LBP is benign (Carey et al. 1995, NEJM)



- A minority of individual go on to develop chronic impairing LBP (Freburger 2009)



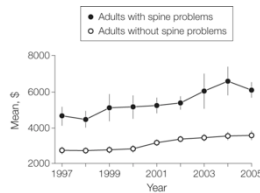
<http://newspaper1.fotoe-kunst/>

Recurrence

- What about those who do recover?
- Do they stay pain-free?
 - 20% to 44% in 1-year
 - 85% in a lifetime

Utilization

- Spine related expenditures have increase from 1997-2005 (Martin et al. JAMA, 2008)



All these resources

- Acute LBP in past year
 - Increase over 14 year span
 - 7.3% (95% CI 6.6% to 8.1%)
 - 10.5% (95% CI 9.5% to 11.4%)
(Freburger 2009)
- Chronic impairing LBP
 - Increased
 - 3.9% (95% CI 3.4% to 4.4%)
 - 10.2% (95% CI 9.3% to 11.0%)
(Freburger 2009)

Is it important to understand the etiology of low back pain?

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Education programmes (interactive)	At risk	IE	IE
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Report Card for Prevention



Secondary Prevention

- Stopping the progression of disease-oriented deterioration
- Chronic Symptoms?
- *Lasting for a long period of time or marked by frequent recurrence; a defined pattern of behavior*



Secondary Prevention

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Another Problem?

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Report Card for Secondary Prevention



Tertiary Prevention

- Returning of a patient to a status of maximum usefulness with a minimum risk of recurrence of the disorder
- Recurrence?
- Another episode of the *same condition* during a defined time point

The Evidence

- There was moderate quality evidence that post-treatment exercises can reduce both the rate and the number of recurrences of back pain. However, the results of exercise treatment studies were conflicting.

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- Exercise are recommended only for chronic low back pain

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 * Advise to stay active.
 * Prescribe medication if necessary (preferably time-contingent): first line is paracetamol; second line is nonsteroidal antiinflammatory drugs, consider muscle relaxants, opioids or antidepressant and anticonvulsive medication (as co-medication for pain relief).
 * Discourage bed rest.
 * Do not advise a supervised exercise programme.
Chronic Pain
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 * Short-term use of medication/manipulation
 * Supervised exercise therapy
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- Guidelines do not support exercise in acute stages. Something doesn't add up.....



Report Card for Tertiary Prevention

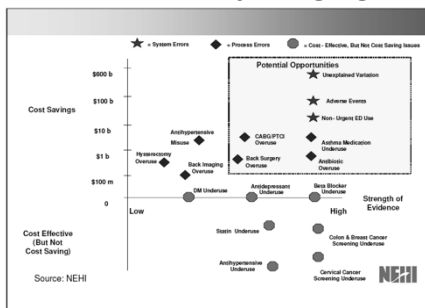


Quaternary Prevention

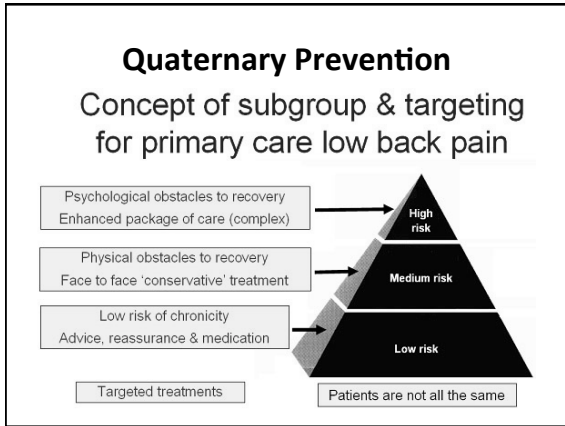
- Methods to mitigate or *avoid results of unnecessary or excessive interventions* in the health system
- In other words, *not spending money and effort on things that don't work*

• Isaacs DM, Marinac J, Sun C. 2004. Radiograph Use in Low Back Pain: A United States Emergency Department Database Analysis. *Journal of Emergency Medicine*. 26:37-45.
 • Weiner AL, MacKenzie RS. 1999. Utilization of Lumbar Spine Radiographs for the Evaluation of Low Back Pain in the Emergency Department. *Journal of Emergency Medicine*. 17:229-33.

Unnecessary Imaging



Source: New England Healthcare System Institute http://media.washingtonpost.com/wp-srv/nation/pdf/healthreport_092909.pdf





Why so Bad?

- Guidelines are reactive, not preventative
- He interests of healthcare providers may outweigh what is truly needed
- Maybe we haven't defined the best preventative components yet?

Predictive Study Designs and Modeling

Adam P. Goode, PT, DPT, PhD
Assistant Professor
Duke University

Cross-Sectional Studies

- Commonly
 - Mailed questionnaires
 - Telephone survey
 - Secondary data analyses
 - Common to determine prevalence and associations
- Very prevalent
- Less expensive
- Less time consuming

Drawbacks

- Done appropriately may produce estimates similar to longitudinal studies
 - Rare disease assumption....not likely with LBP
- What we need to know is the risk of an event knowing information at the present
- Temporality
- Causal Relationships

Predictors

- Non-Modifiable

- Modifiable

Follow-up Time

- Everyone has the same follow-up time
 - Closed cohort
 - Example 1-year follow-up
- Variable follow-up – Open cohort
 - Some participants contribute 6 months, some 1-year, some 1.5 years and some 2-years...etc
- What are the follow ups in the current literature
 - 6 months to 3.3 years

Bias

- Selection Bias
 - Selection into the cohort
 - Selection out of the cohort
- Information Bias
 - How we measure
 - Low back pain
 - Predictors

Missing Data

- Missing – a real problem
 - Losing information makes us suspect of the truth
- Lost to Follow-up
- Some predictors not others
 - Complete case analysis
 - Imputation

Modeling Approach

- Cox Proportional Hazard Models
 - Or similar ---Weibull or Flexible Non-parametric
- Poisson Regression
- Pooled Logistic Regression

Modeling Approach

- Pooled logistic regression
 - Extends the ordinary binary logistic regression to wide panel data
 - Good is short non-variable follow-up
 - Good if censoring or late entry is not an issue
 - Good if a rare disease

Modeling Approach

- Cox Proportional Hazard Approach
 - Survival (AKA-Time-to-Event)
 - Models time from baseline to event occurrence
 - Good for variable follow-up
 - Good if censoring or late entry is an issue
 - Good if exact date of outcome is known
 - If not assumptions are made (Interval or Mid-point censoring)
 - Rarely do we know the exact date of LBP occurrence or have informative censoring

Modeling Approach

- Poisson Regression
 - Good for count data
 - Can model variable follow-up
 - Can be used for common outcomes with robust variance estimator (Greenland et al. AJE.2004 and Zou. AJE.2004)
 - Susceptible to over dispersion
 - Check goodness-of-fit
 - Negative binomial model

Longitudinal Studies

- Costly
- Time consuming
- Complex to design and analyze

Longitudinal Designs

- Can be especially meaningful
 - Improve understanding of etiology of disease
 - Determine predictors of disease
 - Understand trends of disease
- Necessary to determine primary prevention factors

Results of the Systematic Reviews

Chad Cook PT, PhD, MBA, FAAOMPT
Professor and Chair
Walsh University

The Reviews

- First Time Incidence LBP



- First Time Incidence Sciatica



Risk Factors for First Time Incidence Low Back Pain



Risk Factors for First Time Incidence LBP

- *Primary Purpose:* to analyze individual, physical, and psychosocial risk factors in adult community-dwelling and occupational populations that are predictive of first-time LBP.
- *Secondary Purpose:* to meta-analyze the incidence estimates of new LBP within these longitudinal studies to provide an updated estimate of LBP incidence.
- *Primary, Tertiary Findings*

Population

- 2 separate operational definitions of first time LBP;
 - 1) those with subjects at baseline who had never experienced LBP,
 - 2) those that were reported as pain-free at baseline (or, if never experienced LBP was not well reported).Further sub-division occurred for population of focus and studies that examined
 - a) community-dwelling populations were separated from studies of
 - b) occupational populations.

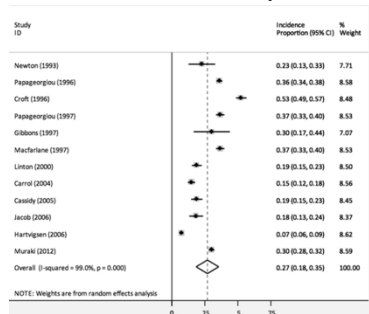
Risk Factors

- Baseline to follow up of at least 6 months.
- At baseline, subjects were required to be 18 years of age or older.
- Both physical and psychosocial risk factors were considered for inclusion in this review.
- Studies were excluded if they failed to report odds ratios/risk ratios/hazard ratios for risk factors.

Results LBP

- 41 studies
- 27,589 total individuals in the 39 unique datasets
- Follow up was 6 months to 12 years
- LBP was defined very differently
- Incidence ranged from 5% to 55.8%
- There were only 6 studies in which no LBP ever was the inclusion

Pooled Incidence Rates Pain Free-Community Based



Most Robust Risk Factors (PF at Baseline Comm) (only include OR, RR, or HR >2.0)

- Other MSK complaints
- Standing or walking > 2 hours per day
- Lifting or moving 25lbs
- Sit for 2 hours
- Strength <50%
- Depression
- Perceived inadequacy of income/job dissatisfaction

--Odds ratio is the ratio of the odds of an event occurring in one group to the odds of it occurring in a comparison group (people without sciatica).
 ---Relative risk is the ratio of the incidence rate among individuals with a given risk factor to the incidence rate among those without it
 ---Hazard ratio represents the rate per unit time that something happens in comparison to the other condition

Most Robust Risk Factors (PF at Baseline Occup) (only include OR, RR, or HR >2.0)

- Obesity
- Poor Health
- Prior LBP
- Poor Back Endurance
- Lifting or carrying >25 pounds
- Manual Jobs
- Moving patients
- Awkward posture
- Mental distress
- Poor relationships at work

Most Robust Risk Factors (First Ever LBP at Baseline Comm) (only include OR, RR, or HR >2.0)

- Standing or walking >2 hours a day
- Moving objects that weigh >25lbs
- Widespread pain
- Limping
- Higher general health scores

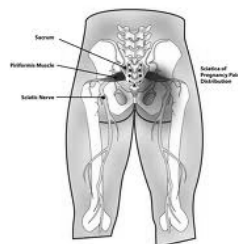
Most Robust Risk Factors (First Ever LBP at Baseline Occ) (only include OR, RR, or HR >2.0)

- Being a woman
- Obesity
- Increased driving time
- Slower velocity doing activities
- Perception of heavy lifting requirements
- Lousy MCS SF-12 scores

Conclusions

- We look for mediators for risk factor assessment
- The following factors, which were investigated in numerous studies cannot be changed
 - Gender (mostly)
 - Previous low back pain

Risk Factors for First Time Incidence Sciatica



**Risk Factors for First Time Incidence
Sciatica**

- *Purpose:* to review studies that examined risk factors associated with sciatica in a healthy population followed longitudinally.
- *Population:* We defined healthy as either: a) no prior history of sciatica, or b) transition from a pain-free state to sciatica.
- *Primary, Tertiary Findings*

Risk Factors

- Baseline to follow up of any timeframe.
- At baseline, subjects were required to be 14 years of age or older.
- Both physical and psychosocial risk factors were considered for inclusion in this review.
- Studies were excluded if they failed to report odds ratios/risk ratios/hazard ratios for risk factors.

Results Sciatica

- 8 studies
- 75,707 total individuals in the 7 unique datasets
- Follow up was 1 to 12 years
- Sciatica was defined very differently
- Incidence ranged from 0.65% to 36%
- Nearly all were Finnish Studies

Most Robust Risk Factors

- Smoking and Ex-smoker • OR 1.5 to 13.1
- Obesity (women) • OR 1.4 to HR 7.1
- Older age (>40years) • OR 2.4 to RR 12.1
- Previous LBP • OR 1.5 to 2.9
- Manual labor • OR 1.3 to 2.6
- Driving >2 hours • OR 2.1 to 2.7

--Odds ratio is the ratio of the odds of an event occurring in one group to the odds of it occurring in a comparison group (people without sciatica).
---Relative risk is the ratio of the incidence rate among individuals with a given risk factor to the incidence rate among those without it
---Hazard ratio represents the rate per unit time that something happens in comparison to the other condition

Conclusions

- We look for mediators for risk factor assessment
- The following factors, which were investigated in numerous studies cannot be changed
 - Age
 - Previous low back pain



Take Home Message

- The larger the trial and the lesser the risk of bias the less robust the risk factor values were
- Few studies investigated the same things
- Identifying risk factors for primary and tertiary prevention of low back pain is not straight forward



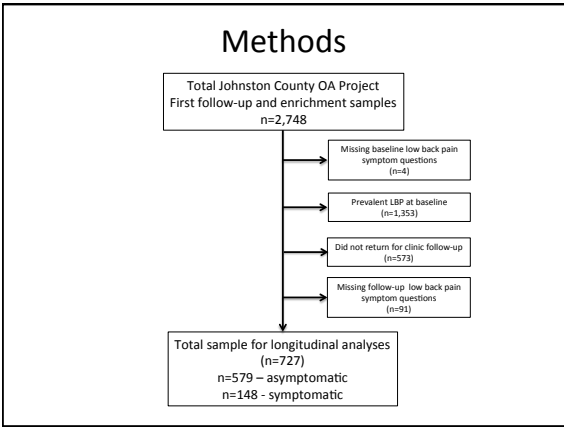
We need a stronger study (s)

Predictors of LBP: Community Based Results
Adam P. Goode, PT, DPT, PhD
Assistant Professor
Duke University

Results from longitudinal studies

- Community-Based Epidemiological Studies
 - Johnston County Osteoarthritis Project
 - Joanne M. Jordan, MD, MPH – Principle Investigator
 - Research on Osteoarthritis/Osteoporosis Against Disability
 - Muraki and colleagues

Predictors of LBP: Analyses From the Johnston County OA Project



- ### Predictors
- Non-Modifiable
 - Age

 - Race
 - African American
 - Caucasian

 - Gender

Predictors

- Modifiable
 - Body Mass Index (continuous)
 - Education (<12 years, =12 years, >12 years)
 - General Health Status (Excellent/Good vs Fair/Poor)
 - Centers for Epidemiological Studies Depression Scale (CES-D) –(categorized at >=16 vs <16)
 - Health Assessment Questionnaire (categorized 0, 1, 2)

Predictors (con't)

- Stanford Health Assessment Questionnaire (HAQ)
 - Generic functional status measure
 - 12 individual functions covering 8 domains (dressing, arising, eating, walking, reaching, gripping, chores and hygiene)
 - Scored 0-3 (0= no difficulty, 1=little difficulty, 2=much difficulty and 3=unable)
 - Scores are averaged and categorized (0-2)

Outcomes

- Low back pain
 - “On most days do you have symptoms of pain, aching or stiffness in your lower back?”
- Disease Specific Function
 - 24 item Roland Morris Low Back Pain and Disability Questionnaire

Analyses

- Means and proportions
- Incidence proportion and 95% confidence intervals (CI)
- Wilcoxon-Rank Sum Tests
 - RMDQ Scores
 - Race and Gender

Predictive Model

- Multivariable Poisson Regression
 - Person-time – due to variable follow-up
 - Robust Variance Estimator
- Results stratified by gender and race
 - Tests for homogeneity of effects
- Pearson chi square statistic p-values used to assess goodness-of-fit
- All tests of differences were 2-sided and statistical significance considered <0.05

Sensitivity Analyses

- Incidence and follow-up times for the combination of time points
- Baseline demographic and clinical characteristics for those who did and did not return for clinical follow-up

RESULTS

Incidence Proportion

LBP severity and Disability

Sensitivity Analyses

- Incidence and Follow-Up Times

T1*
Clinical and interview data
from 2003 – 2004.
N=1,015

+

T1
Clinical and interview data
from 1999-2004.
N=1,934

- Similar Incidence Proportion

- T1* = 20.4%
- T1 = 20.3%

- Similar Follow-Up Times

- T1* = 5.82 median years
- T1 = 6.57 median years

Sensitivity Analyses

Discussion

- First US rural general population cohort findings for LBP

- Similar incidence to other studies
 - No difference in race or gender

- Clinical interview vs. mailed questionnaire

Discussion

- We did not find that age, health status, BMI, education or gender to be significant predictors of LBP

- Function status the only significant predictor
 - “Sixth Vital Sign” (Bieraman AS. Functional Status. J Gen Intern Med. 2003)

- Robust – similar across gender and a stronger predictor for AAs

Discussion

- Limited evidence to support “exercise” for prevention of LBP (Lahad and Deyo, JAMA, 1994)
- Not all “exercise” interventions are the same for LBP (Carey, ACP J Club, 2006)
- Older high risk population found in these analyses more appropriate target

Strengths

- Large US rural general population sample
 - Stratified probability sample
- Balance of gender and race
- Longitudinal analyses
- Clinical interview and measurement of predictors

Drawbacks

- Unable to determine recurrent vs. first time LBP
- Unable to determine chronicity
- Large lost to follow-up
- Long follow-up period

Limitations

- Selection Bias
 - Attrition – Lost to follow-up
- Measurement Bias
 - Length of Follow-up

Methodological Considerations Selection Bias

- Attrition
 - 44% lost to follow-up
- Selection out of the cohort
 - Of those not returning
 - 32% died
 - 13% had a decline in health status
 - 20% refused
 - A younger and healthier baseline

Incident Low Back Pain? Recurrent vs First Time?



Conclusion

- The incidence of LBP was similar to previous population based studies without significant differences in race or gender
- The only significant predictor was decreased functional status
 - A similar significant risk was found across gender however AAs were nearly twice the risk of Caucasians

Pooling the Review Findings Thus Far

Chad Cook PT, PhD, FAAOMPT
Professor and Chair
Walsh University

Moderators vs. Mediators

- *Moderator variables* change the strength of an effect or relationship between two variables, but can't be modified themselves (e.g., age, gender).
- *Mediator variables* describe the process that occurs to create the relationship between two variables, and as such are always dynamic changeable properties of individuals (e.g., emotions, beliefs, behaviors).


Change the Mediator!

- Change the mediator and you can change the outcome!

*GIVE a Man a Fish
and he will eat for a day.
TEACH a Man to Fish
and he will sit in a boat
and drink beer all day
FISH 24:7*

Consider History

- ... "limited evidence ...that exercises to strengthen back or abdominal muscles and to improve overall fitness can decrease the incidence and duration of low back pain episodes."
- "minimal evidence to support the use of educational strategies to prevent low back pain"
- There is no evidence supporting risk factor modification for preventing low back pain (smoking cessation and weight loss), there are other reasons to recommend the interventions.



Lahad et al. The effectiveness of four interventions for the prevention of low back pain. 1994 Oct 26;272(16):1286-91.

Our Most Robust Risk Factors Mediators

- History of Low Back Pain
- Don't smoke or quit smoking
- Improving Overall Health Behaviors
- Improving Low Back Endurance
- Improving Strength
- Improving one's functional status
- Improving ergonomics
- Depression




Never Get LBP in the First Place



because circular reasoning works






**Don't Smoke or Quit Smoking
(Sciatica only)**



Health Behaviors

- Sum of Smoking, overweight, and lack of physical exercise



Miranda H, Viikari-Juntura E, Punnett L, Riihimäki H. Occupational loading, health behavior and sleep disturbance as predictors of low-back pain. *Scand J Work Environ Health* 2008;34(6):411-9.

Improving Endurance

- 126 persons who were free from back complaints at entry, 33 developed low-back pain during a follow-up of 1 year.
- Adjusted for age, sex, and occupation, the odds ratio of a new low-back pain in those with poor performance was **3.4 (95% confidence interval, 1.2-10.0)** compared to those with medium or good performance.



	Men	Women
Low risk	104-240 sec	110-240 sec
Medium risk	58-104 sec	58-110 sec
High risk	<58 sec	

Alaranta et al. Static back endurance and the risk of low-back pain. Clin Biomech. 1995 Sep;10(6):323-324.

Improving Strength of Quads

- The subject held 50% of maximal contraction to fatigue. Visual feedback and encouragement were given. When force output fell below 40% of maximal effort, the test was terminated and the time was recorded.



Grip Strength

- Smedley dynamometer
- Higher strength is a protective factor by 2.0 times



Hartvigsen J, Frederiksen H, Christensen K. Physical and mental function and incident low back pain in seniors: a population-based two-year prospective study of 1387 Danish Twins aged 70 to 100 years. Spine (Phila Pa 1976) 2006;31(14):1628-32.

Improving Function

- Primarily for older people
- Measured with the HAQ



Ergonomics



- Standing
- Sitting (protective)
- Twisting
- Awkward postures
- Moving patients in bed



Depression

- *More studies suggest no relationship*
- Few independent psychosocial risk factors have been demonstrated to exist. Randomized clinical trials aimed at modifying these factors have shown little impact on patient prognosis. Qualitative research might be valuable to explore further the field of LBP and to define new management strategies.

Ramond et al. Psychosocial risk factors for chronic low back pain in primary care— a systematic review. Fam Pract. 2011 Feb;28(1):12-21.

Robustness of These?



- *Not very impressive.....*
- Low OR's/RR's
- Not Always significant across all studies
- Limited value in prevention studies

Primary Prevention and the General Population

What We Know So Far

Adam P. Goode, PT, DPT, PhD
Assistant Professor
Duke University

Interventions

(Lahad et al. JAMA. 1994 and Linton and van Tulder. Spine. 2001)

- "Exercise" and aerobic exercises
 - Paraspinal strengthening
 - Trunk Flexibility
 - "Cardiovascular fitness"
- Mechanical Supports
- Back Pain Education
- Risk factor modification

“Exercise”

- Study Population
 - Hospital Workers, Nurses, Industrial Workers
- Interventions
 - Variety of “Exercises”
 - Calisthenics and stretching
 - Strengthening – pelvic tilt, isometrics
 - Aerobic exercise- functional coordination exercise, cardiovascular fitness, aerobic dynamic exercise
 - Relaxation
 - Body mechanic instruction

“Exercise” con’t

- Outcomes
 - Pain – episodes and intensity
 - Endurance – paraspinal
 - Work absence or Interference or Perceived work situation
 - Sick days
 - Pain pressure threshold
 - Physical Fitness

“Exercise” con’t

- Comparators
 - Back school, Body mechanics

 - Advice to exercise, information and free health club membership

 - No intervention

“Exercise” con’t

- Results
 - 6 RCT’s
 - 4/5 studies exercise reduced back pain and work absenteeism when compared to nothing – efficacy
 - Little support for exercise on pain when compared to advice or health club membership – effectiveness

Exercise The Bottom Line

- There is limited evidence to recommend exercise to prevent LBP in asymptomatic adults (Lahad et al. JAMA. 1994)
- There is consistent evidence that exercise may be effective in preventing back pain. (Linton and van Tulder. Spine. 2001)
- Physical Exercise is recommended to prevent absence due to back pain and the occurrence or duration of further back pain episodes (Burton, AK. From the European Guidelines for Prevention in LBP. 2005)
- Although exercise has not been shown to prevent low back pain, regular physical activity has other proven health benefits, including prevention of cardiovascular disease, hypertension, type 2 diabetes, obesity, and osteoporosis. (U.S Preventive Services Task Force)

“Exercise”



Lumbar supports

- Provide support of the trunk prevent over flexion
- Awareness
- Increase intra-abdominal pressure


Lumbar Supports

- 6 studies
 - 4 Randomized controlled trials
 - 2 Nonrandomized controlled trials
- 3 out of 4 RCT's had a effectiveness feel comparing to education
- Methodological Problems Throughout
 - Drop outs
 - Compliance

Lumbar Supports The Bottom Line

- Currently insufficient evidence to make a recommendation about the use of orthotic devices for LBP prevention (Lahad et al. JAMA.1994)
- There is strong and consistent evidence that lumbar supports are not effective in preventing back pain. (Linton and van Tulder. Spine. 2001)
- Lumbar supports are not recommended for prevention of LBP in the general population. (Burton, AK. From the European Guidelines for Prevention in LBP. 2005)
- Neither lumbar supports nor back belts appear to be effective in reducing the incidence of LBP. (U.S Preventive Services Task Force)

Back School or Education



<http://www.photos-public-domain.com/wp-content/uploads/2012/07/6-school-letter-@400.jpg>

Risk Factor Modification

- Individual
 - Weight, Strength, Smoking
- Biomechanical
 - Lifting, Posture
- Psychosocial
 - Job control and dissatisfaction

Risk Factor Modification
The Bottom Line

- There is no evidence to support risk factor modification (smoking, obesity and psychological) for LBP prevention (Lahad et al. JAMA.1994)
- There is no good quality evidence on the effectiveness of risk factor modification. (Linton and van Tulder, Spine. 2001)
- No RCT shows modification (smoking) helps prevent LBP (U.S Preventive Services Task Force)

Risk Factor Modification



<http://fontgettr.com/wordpress/most-important-ten-questions-to-ask-yourself/question-mark/>

Summary

- Back support and back school / education would not pass the course
- “Exercise” would pass but could be better defined for implementation and research purposes
- Risk factor modification with a robust risk factor that incorporated exercise.....there’s an idea

Questions
