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# Effectiveness of a bundled intervention of decolonization and prophylaxis to decrease Gram positive surgical site infections after cardiac or orthopedic surgery: systematic review and meta-analysis

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Cite this as: *BMJ* 2013;346:f2743  
doi: 10.1136/bmj.f2743

This is a summary of a paper that was published on [bmj.com](http://bmj.com) as *BMJ* 2013;346:f2743

## STUDY QUESTION

Is a bundle that includes nasal decolonization and glycopeptide prophylaxis, effective in preventing surgical site infections caused by Gram positive bacteria among patients undergoing cardiac or orthopedic surgery?

## SUMMARY ANSWER

Seven studies assessed a bundle including decolonization and glycopeptide prophylaxis for only patients colonized with methicillin resistant *Staphylococcus aureus* (MRSA) and found a significantly protective effect against Gram positive surgical site infections.

## WHAT IS KNOWN AND WHAT THIS PAPER ADDS

Surgical site infections significantly increase hospital length of stay, readmission rates, healthcare costs, and mortality rates. A bundle that included nasal decolonization and anti-MRSA prophylaxis for MRSA carriers was significantly protective against Gram positive surgical site infections.

## Selection criteria for studies

In this systematic literature review and meta-analysis, we searched PubMed (1995-2011), the Cochrane database of systematic reviews, CINAHL, Embase, [clinicaltrials.gov](http://clinicaltrials.gov), and conference abstracts to determine the effectiveness of a bundle of interventions to prevent surgical site infections caused by Gram positive bacteria among patients undergoing cardiac or orthopaedic surgery.

## Primary outcome(s)

The primary outcomes were surgical site infections caused by Gram positive bacteria and by *S aureus*.

## Main results and role of chance

Thirty-nine studies were included. The pooled effects of 17 studies showed that nasal decolonization had a significantly protective effect against surgical site infections caused by *S aureus* (pooled relative risk 0.39, 95% confidence interval 0.31 to 0.50) when all patients underwent decolonization (0.40, 0.29 to 0.55) and also when only *S aureus* carriers underwent decolonization (0.36, 0.22 to 0.57). The pooled effects of 15 prophylaxis studies showed that glycopeptide prophylaxis was significantly protective against surgical site infections caused by MRSA compared with prophylaxis using  $\beta$  lactam antibiotics (0.40, 0.20 to 0.80), and a non-significant risk factor for methicillin susceptible *S aureus* infections (1.47, 0.91 to 2.38). Seven studies assessed a bundle including decolonization and glycopeptide prophylaxis for only patients colonized with MRSA and found a significantly protective effect against Gram positive surgical site infections. Use of this bundle could result in cost savings since the US Centers for Medicare and Medicaid Services no longer reimburse hospitals for some surgical site infections, and the high costs of these infections are also detrimental to publicly funded healthcare systems, such as the UK's National Health Service.

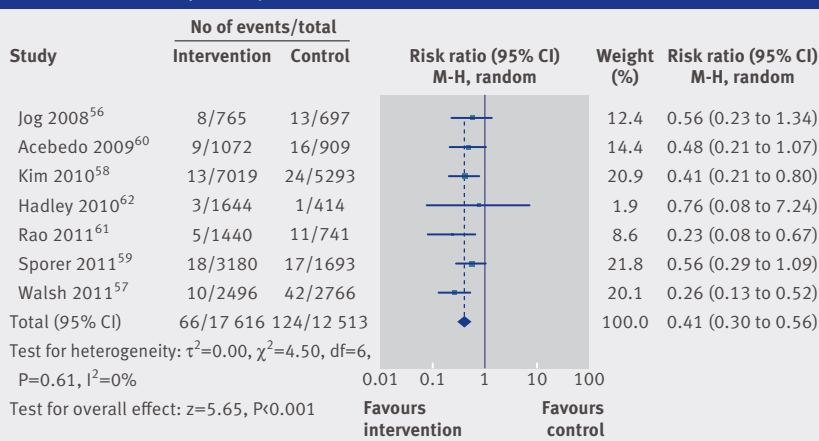
## Bias, confounding, and other reasons for caution

Of the 39 studies included in the meta-analysis, 13 were randomized controlled trials and 26 were observational studies. When we evaluated these studies using the Cochrane risk of bias tool and the Downs and Black tool, we found that the randomized controlled trials had a fairly low risk of bias and that the observational studies had good external validity but poor internal validity. Evidence of publication bias was lacking among the seven studies that evaluated the bundle to prevent Gram positive surgical site infections.

## Study funding/potential competing interests

This project was funded by the Agency for Healthcare Research and Quality (contract No HHS2902006000211) of the US Department of Health and Human Services. We have no competing interests.

Forest plot of studies that assessed a bundle of interventions to prevent surgical site infections caused by Gram positive bacteria



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## Associations between the organisation of stroke services, process of care, and mortality in England: prospective cohort study

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Cite this as: *BMJ* 2013;346:f2827  
doi: 10.1136/bmj.f2827

This is a summary of a paper that was published on [bmj.com](http://bmj.com) as *BMJ* 2013;346:f2827

### STUDY QUESTION

What are the relations between the organisation of stroke services, process measures of the quality of care (the assessments, interventions, and treatments that patients receive), and mortality outcomes after ischaemic stroke?

### SUMMARY ANSWER

Patients admitted to more organised stroke services (based on a score of their staffing, facilities, and service level) are more likely to receive high quality care, as measured by the provision of six audited aspects of care. Patients receiving high quality care have reduced 30 day mortality compared with patients receiving lower quality care.

### WHAT IS KNOWN AND WHAT THIS PAPER ADDS

Although an evidence base is established from randomised controlled trials, it is not known if process measures of the quality of care predict mortality after stroke. We found an association between the organisation of stroke services and the quality of care that patients received, and that patients receiving the highest quality care had a reduced risk of mortality in the 30 days after stroke.

### Participants and setting

All 36 197 adults with acute ischaemic stroke admitted to 106 English hospitals participating in the Stroke Improvement National Audit Programme and Sentinel Stroke Audit from 1 April 2010 to 30 November 2011.

### Design, size, and duration

We carried out a prospective cohort study. Using multi-level multivariable logistic regression and instrumental variable analysis we modelled the relations between the organisation of stroke services, process of care, and mortality.

### Main results and the role of chance

Three of the six process measures were associated with a reduced 30 day mortality: review by a stroke consultant within 24 hours of admission (adjusted odds ratio 0.86, 95% confidence interval 0.78 to 0.96), nutrition screening and formal swallow assessment within 72 hours (0.83, 0.72 to 0.96), and antiplatelet therapy and adequate fluid and nutrition for the first 72 hours (0.55, 0.49 to 0.61).

### Associations between quality score and 30 day mortality

Analyses (No of patients)	Quality score 5 or 6 v 0-4	
	Odds ratio (95% CI)	P value
Univariable analysis (n=25 776)	0.60 (0.55 to 0.66)	<0.001
Multivariable analysis* (n=25 776)	0.74 (0.66 to 0.83)	<0.001
Multivariable analysis*: excluding death or palliative care in first 72 hours (n=20 457)	0.77 (0.68 to 0.88)	<0.001
Instrumental variable analysis* (n=25 776)	0.62 (0.46 to 0.83)	0.0001

\*Adjusted for age, sex, independence in activities of daily living before stroke, requirement for oxygen therapy in first 24 hours, reduced consciousness in first 24 hours, arm weakness or sensory impairment, leg weakness or sensory impairment, dysphasia, and hemianopia.

Patients receiving five or six of these care processes had a reduced risk of 30 day mortality compared with those receiving 0-4 (0.74, 0.66 to 0.83). A similar result was found in the analysis using the organisational score of the admitting stroke service as an instrumental variable to control for unmeasured confounding (odds ratio 0.62, 95% confidence interval 0.46 to 0.83).

### Bias, confounding, and other reasons for caution

Although the study used several approaches to reduce indication bias, the findings may be influenced by unmeasured confounding between process of care and mortality. Hospital participation in the Stroke Improvement National Audit Programme and Sentinel Stroke Audit was voluntary and we cannot exclude different case ascertainment and inclusion of patients between hospitals.

### Generalisability to other populations

The findings relating to the individual process measures are specific to patients with acute ischaemic stroke. The analysis of the associations between measures of how health services are organised, the process of care that patients receive, and mortality outcomes is relevant to the study, development, and validation of quality measures in other areas of healthcare.

### Study funding/potential competing interests

AGR is National Clinical Director for Stroke, NHS England. We have no other competing interests.

# Consumers' estimation of calorie content at fast food restaurants: cross sectional observational study

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Cite this as: *BMJ* 2013;346:f2907  
doi: 10.1136/bmj.f2907

This is a summary of a paper that was published on [bmj.com](http://bmj.com) as *BMJ* 2013;346:f2907

## Response on [bmj.com](http://bmj.com)

"The numbers on the fast food label, like warning symbols on cigarette packets or alcohol bottles, mean nothing to those for whom time is money." Phastagir S Sheriff, Faculty of Medicine, Benghazi University, Libya

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## STUDY QUESTION

How accurate are adults, adolescents, and parents of school age children in estimating the calorie content of their meals at fast food restaurants?

## SUMMARY ANSWER

Participants dining at most fast food restaurants underestimated calorie content of purchased meals, especially large meals.

## WHAT IS KNOWN AND WHAT THIS PAPER ADDS

Consumers tend to underestimate the calorie content of fast food restaurant meals, especially for high calorie meals, though previous studies have been conducted in experimental settings, focused on a narrow range of fast food restaurants, or had limited racial/ethnic or age group diversity. In this study among diverse racial/ethnic groups visiting six fast food restaurant chains, we found that adults, adolescents, and parents of school age children underestimated calorie content of meals.

## Participants and setting

In 2010 and 2011, we enrolled 1877 adults (aged 18 and over) and 330 school age children (aged 3-15) visiting restaurants at dinnertime (evening meal), and 1178 adolescents (aged 11-20) visiting restaurants after school or during lunchtime in four cities in New England, United States.

## Design

This study used a repeated cross sectional design with multiple visits to each of 89 fast food restaurants across the study area. Over the two years of data collection, we made 625 restaurant visits.

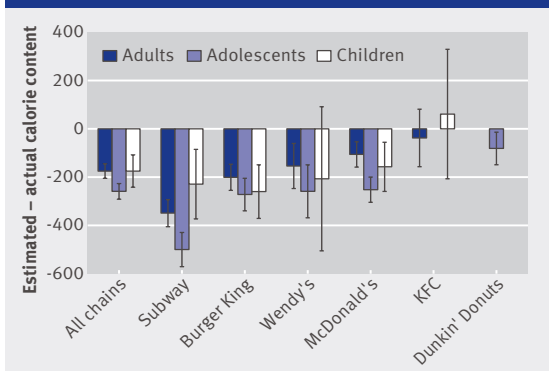
## Primary outcome

The primary outcome included study participants' estimation of calorie content of purchased meals. For the school age children sample, their accompanying parent or legal guardian provided the estimate.

## Main results and the role of chance

Among those we approached, we enrolled 40% of adults, 42% of adolescents, and 45% of parents with school age children in this study. The mean (SD) actual calorie content of purchased meals was 836 calories (465), 756 calories (455), and 733 calories (359) for adults, adolescents, and school age children (one calorie is equivalent to 4.18 kJ). The mean differences between estimated and actual calorie content were underestimates of 175 calories (95% confidence interval 145 to 205), 259 calories (227 to 291), and 175 calories (108 to 242), respectively. Nearly a quarter of participants in each sample underestimated calorie content by 500 or more calories. The mean underestimation was larger among

Mean difference between estimated and actual calorie content of meals bought at fast food restaurants



Subway diners than at other chains for adults (349 calories, 95% confidence interval 293 to 406) and adolescents (500, 429 to 571) with similar values for all chains among school age children. With McDonald's diners as the reference, adult diners at Subway and Burger King had significantly more underestimation of calorie content as did adolescent diners at Subway ( $P < 0.001$ ). Adolescent diners at Dunkin' Donuts had less underestimation of meal calorie content than McDonald's diners. In multivariable models, estimated calorie content of meals was strongly associated with actual calorie content for each of the samples. Adults and adolescents dining at Subway estimated 20% (4% to 34%) and 25% (1% to 43%) lower calorie content than McDonald's diners. Black people, Hispanics, Asians, and "other" race/ethnicity or multiracial adults and adolescents estimated lower meal calorie content than white people.

## Bias, confounding, and other reasons for caution

Because more than half of eligible individuals did not participate, the participants in our study might not represent all customers of the restaurants. We also could not enrol diners in the drive through section of restaurants, who might be different than those walking into restaurants, and we could not weigh food to measure actual calorie consumption.

## Generalisability to other populations

We enrolled a diverse sample of participants in four large cities in New England; 18-38% were white and 49-63% were of black or Hispanic race/ethnicity.

## Study funding/potential competing interests

Funders for this study included the National Heart, Lung, and Blood Institute of the National Institutes of Health, the Robert Wood Johnson Foundation's Health and Society Scholars and Healthy Eating Research programs, and the Robert H Ebert Fellowship, funded by the Harvard Pilgrim Health Care Foundation through the Eleanor and Miles Shore Fellowship Program at Harvard Medical School.

# Helmet legislation and admissions to hospital for cycling related head injuries in Canadian provinces and territories: interrupted time series analysis

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Cite this as: *BMJ* 2013;346:f2674  
doi: 10.1136/bmj.f2674

This is a summary of a paper that was published on bmj.com as *BMJ* 2013;346:f2674

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## STUDY QUESTION I

s provincial bicycle helmet legislation associated with a reduction in the rate of admissions to hospital for cycling related head injuries among young people and adults in Canada?

## SUMMARY ANSWER

Reductions in the rates of hospital admissions for cycling related head injuries were greater in provinces with helmet legislation, but injury rates were already decreasing before the implementation of legislation, and the rate of decline was not appreciably altered by legislation. In the context of Canada's existing safety campaigns, improvements to the cycling infrastructure, and the passive uptake of helmets the incremental contribution of provincial helmet legislation to reduce hospital admissions for cycling related head injuries seems to have been minimal.

## WHAT IS KNOWN AND WHAT THIS PAPER ADDS

Published controlled before and after studies among young people suggest a protective effect of helmet legislation on cycling related head injuries. Most of these studies, however, did not account for existing trends in cycling related injury rates, nor did they investigate the association between helmet legislation and head injuries in adults. Our analyses included both young people and adults and we explicitly modeled baseline trends in the rate of cycling related head injuries.

## Participants and setting

This study included all admissions (n=66 716) to acute care hospitals in Canada owing to cycling related injury

between 1994 and 2008. Between 1994 and 2003, six of 10 Canadian provinces implemented helmet legislation.

## Study design

Using the Canadian national trauma registry, we conducted a controlled, interrupted time series analysis to compare the percentage change in the rate of head injuries in Canadian provinces with helmet legislation with the percentage change in provinces and territories without legislation. Using segmented regression analysis we estimated the rate ratio of cycling related head injuries associated with helmet legislation.

## Primary outcome

Rate of hospital admissions for cycling related head injuries before and after the implementation of provincial helmet legislation.

## Main results and the role of chance

Among young people the rate of head injuries in provinces with helmet legislation decreased by 54.0% (95% confidence interval 48.2% to 59.8%) compared with 33.1% (23.3% to 42.9%) in provinces and territories without legislation. Among adults the rate of head injuries declined by 26.0% (16.0% to 36.3%) in provinces with legislation but remained constant in provinces and territories without legislation. After taking baseline trends into consideration, however, we were unable to detect an independent effect of legislation on the rate of hospital admissions for cycling related head injuries.

## Bias, confounding, and other reasons for caution

Concurrent interventions to improve cycling safety may have biased associations between helmet legislation and admissions to hospital for head injuries. In some provinces, the power of the segmented regression analysis may have been reduced by too few prelegislation time points or few injuries at each time point.

## Generalisability to other populations

Although this study is based on Canadian data, similar results could be expected anywhere helmet legislation is a component of a comprehensive strategy to reduce cycling related injuries.

## Study funding/potential competing interests

JD is a Canadian Institute of Health Research Vanier graduate scholar, AFT is a recipient of a research career award from the Fonds de la Recherche du Québec-Santé, and RZ is a recipient of a RCT-mentorship award from the Canadian Institute of Health Research. We have no competing interests.

**Change in rate of hospital admissions for head injuries per injured cyclist one year after implementation of helmet legislation, estimated from segmented regression analysis that takes baseline trends into consideration (rate ratios <1 suggest a protective effect of helmet legislation)**

