Widespread errors are fixable by better design

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chi+med
making medical devices safer

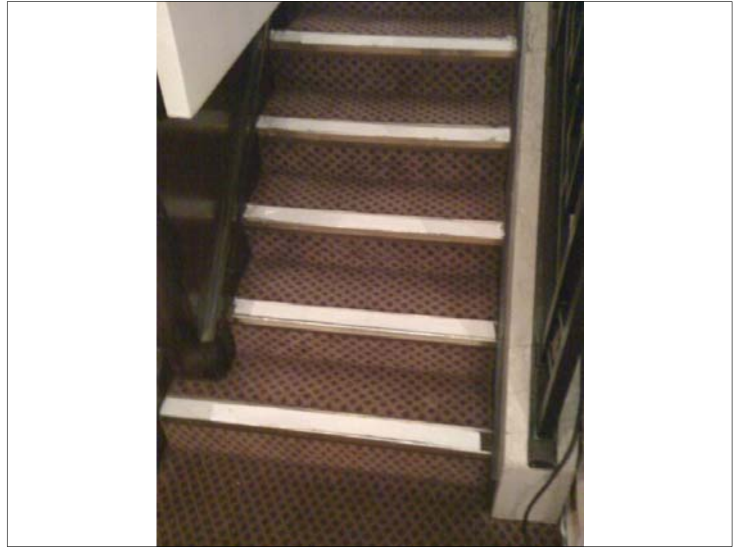
EPSRC

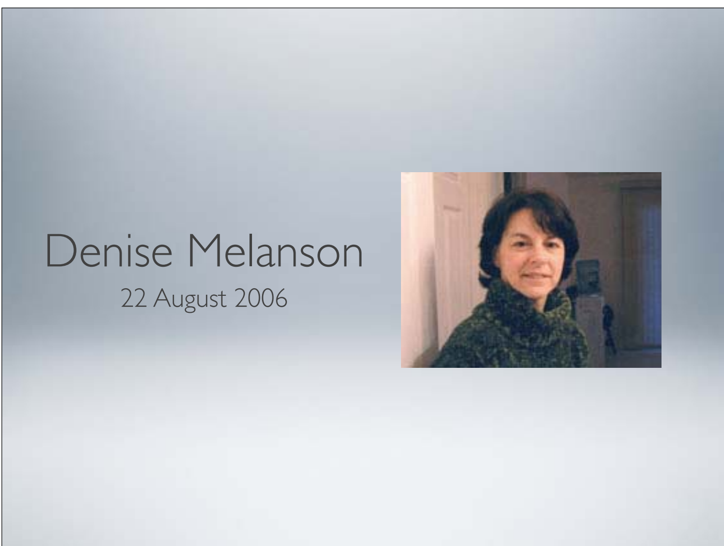
chfg clinical human factors group
working with clinical professionals and managers to make healthcare safer

Computerized approaches are ideal for **eliminating error** because reliability can approach 100%

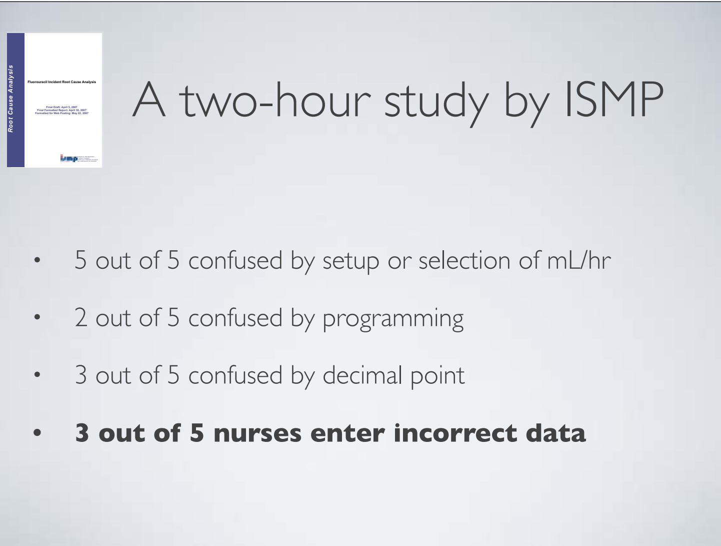
D W Bates *et al*, "Incidence of ADEs and potential ADEs," *JAMA*, **274**:29–34, 1995.

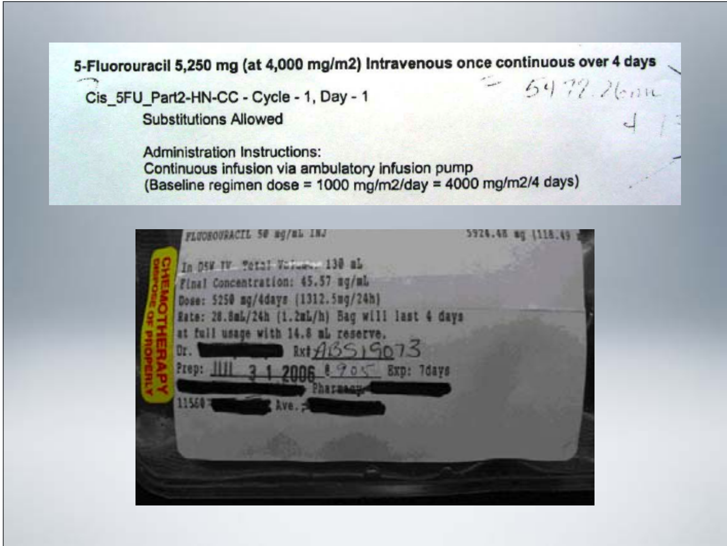
4
5
2
3
1
LG

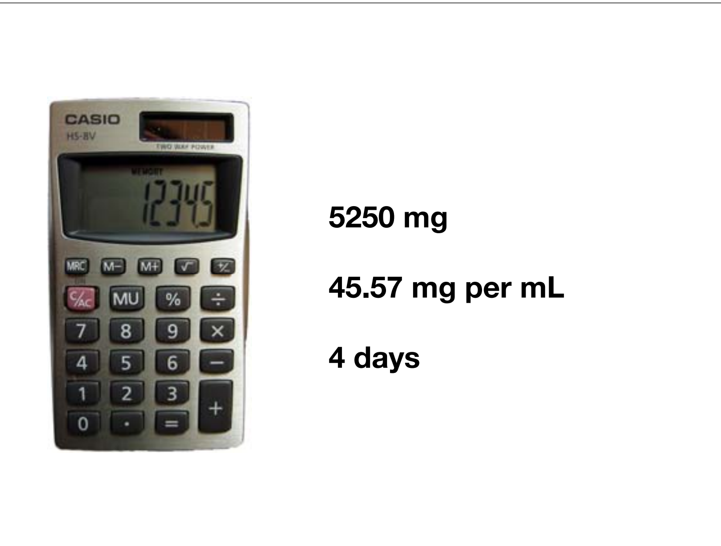



Denise Melanson
22 August 2006

1 SELECT mg/mL
2 SELECT µg/mL
3 SELECT mL
HOSPIRA
aimplus
OPTIONS
STOP
START
HELP
BACKUP
CHANGE
SILENCE
7 8 9
4 5 6
1 2 3
0
PRIME
NO
YES/ENTER







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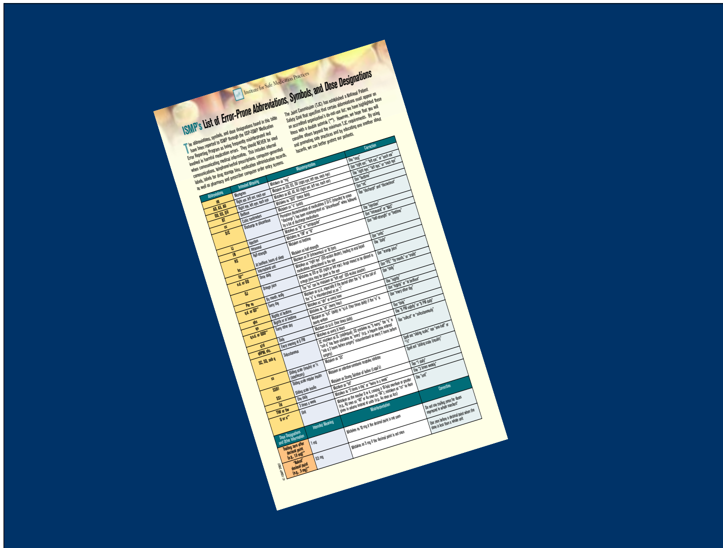
MRC
=

22 keystrokes



ISMP's List of *Error-Prone Abbreviations*, S

The abbreviations, symbols, and dose designations found in this table have been reported to ISMP through the USP-ISMP Medication Error Reporting Program as being frequently misinterpreted and involved in harmful medication errors. They should NEVER be used when communicating medical information. This includes internal communications, telephone/verbal prescriptions, computer-generated labels, labels for drug storage bins, medication administration records, as well as pharmacy and prescriber computer order entry screens.

The Joint
Safety Go
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items wit
consider
and prom
hazards,

Abbreviations	Intended Meaning	Misinterpretatio
µg	Microgram	Mistaken as "mg"
AD, AS, AU	Right ear, left ear, each ear	Mistaken as OD, OS, OU (right eye, left ey

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Reducing number entry errors: solving a widespread, serious problem

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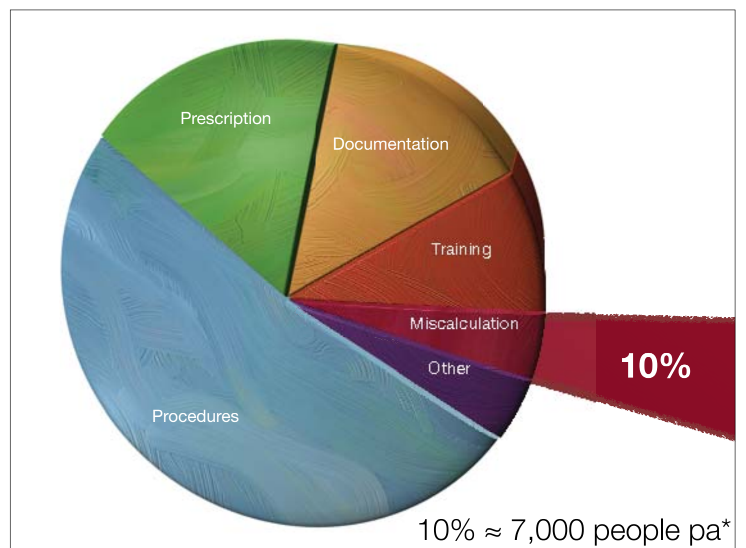
Number entry is ubiquitous: it is required in many fields including science, healthcare, education, government, mathematics and finance. People entering numbers are to be expected to make errors, but shockingly few systems make any effort to detect, block or otherwise manage errors. Worse, errors may be ignored but processed in arbitrary ways, with unintended results. A standard class of error (defined in the paper) is an 'out by 10 error', which is easily made by miskeying a decimal point or a zero. In safety-critical domains, such as drug delivery, out by 10 errors generally have adverse consequences. Here, we expose the extent of the problem of numeric errors in a very wide range of systems. An analysis of better error management is presented: under reasonable assumptions, we show that the probability of out by 10 errors can be halved by better user interface design. We provide a demonstration user interface to show that the approach is practical.

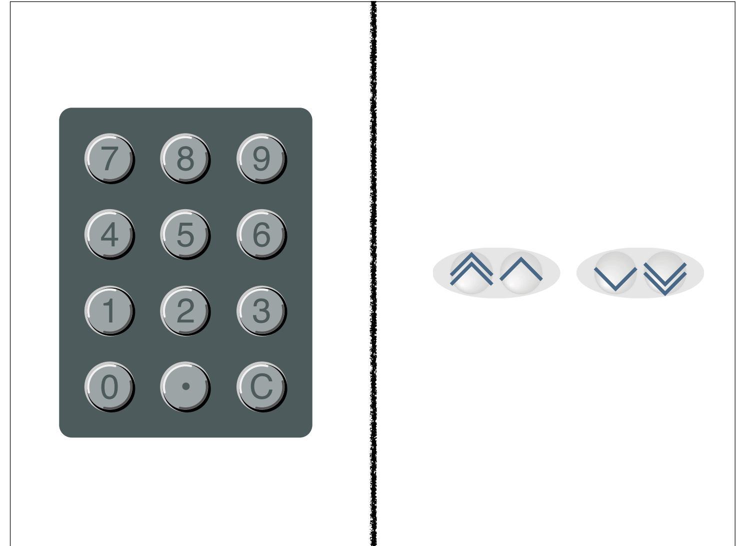
halve the death rate

To kill an error is as good a service as, and sometimes even better than, the establishing of a new truth or fact.

(Charles Darwin 1879 [2008], p. 229)



Graseby 3400


7 8 9
4 5 6
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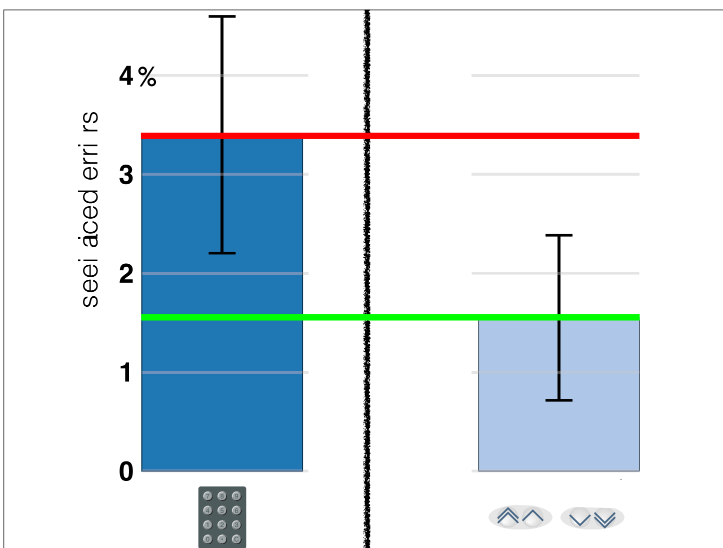
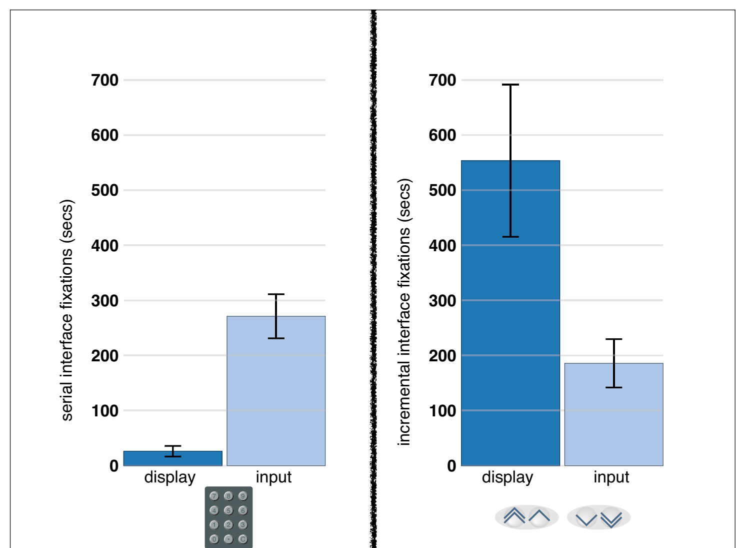
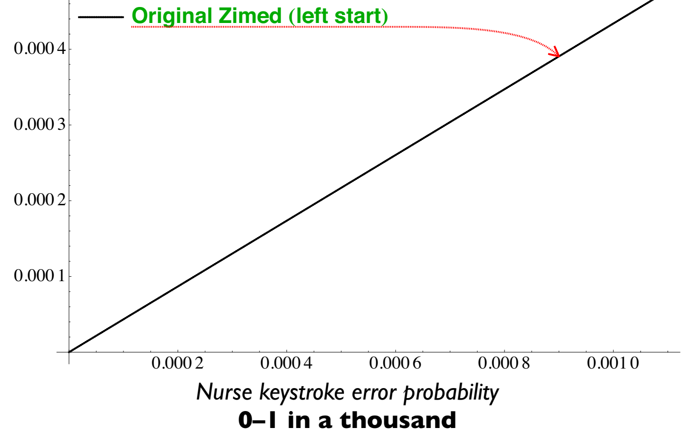

4 %
3
2
1
0


serial interface fixations (secs)
700
600
500
400
300
200
100
0
display
input
incremental interface fixations (secs)
700
600
500
400
300
200
100
0
display
input

Zimed AD Ambulatory Syringe Driver

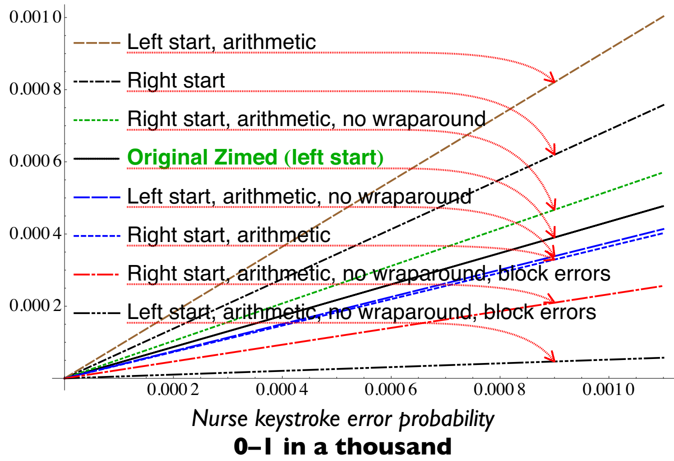
Out by 10 probability

0–1 in a thousand



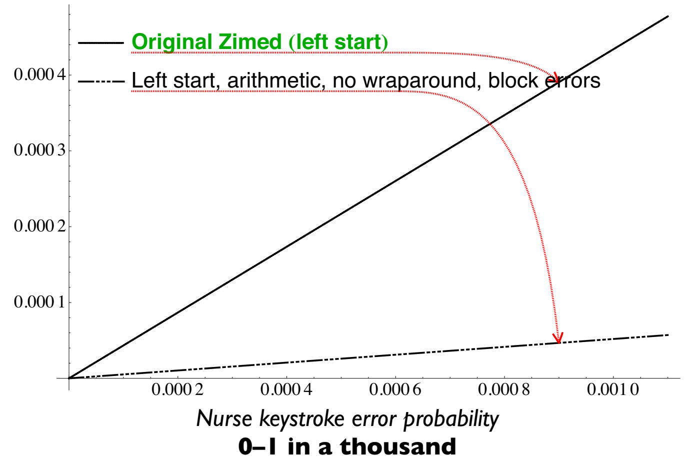
Out by 10 probability

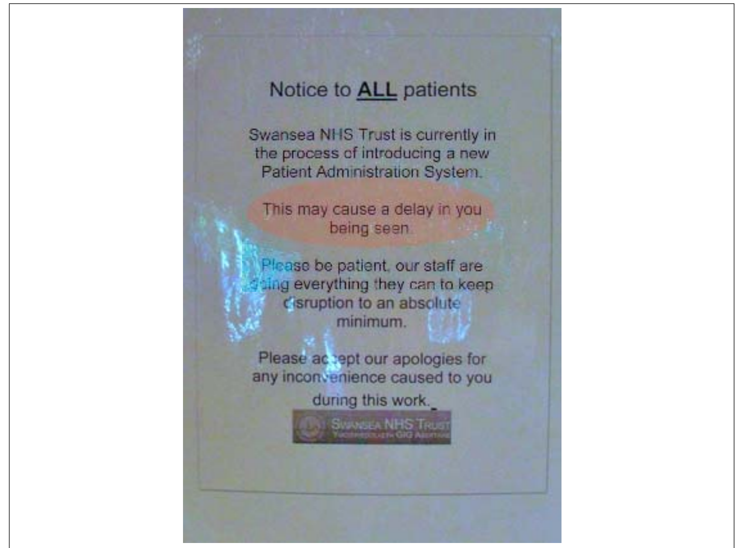
0–1 in a thousand



Out by 10 probability

0–1 in a thousand





Pediatrics, 2005

Unexpected Increased Mortality After Implementation of a Commercially Sold Computerized Physician Order Entry System

Yong Y. Han, MD*‡; Joseph A. Carcillo, MD*‡§; Shekhar T. Venkataraman, MD*‡§; Robert S.B. Clark, MD*‡§; R. Scott Watson, MD, MPH*‡§‖; Trung C. Nguyen, MD*‡; Hülya Bayir, MD*‡; and Richard A. Orr, MD*‡§

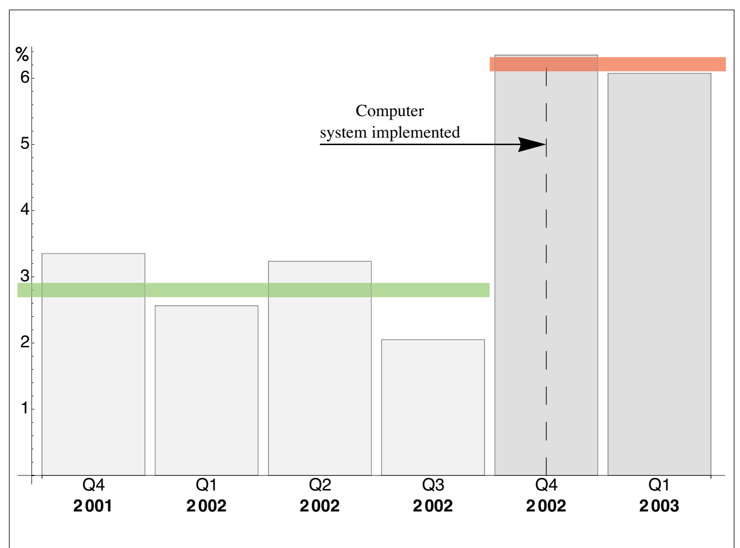
ABSTRACT. *Objective.* In response to the landmark 1999 report by the Institute of Medicine and safety initiatives promoted by the Leapfrog Group, our institution implemented a commercially sold computerized physician order entry (CPOE) system in an effort to reduce medical errors and mortality. We sought to test the hypothesis that CPOE implementation results in reduced mortality among children who are transported for specialized care.

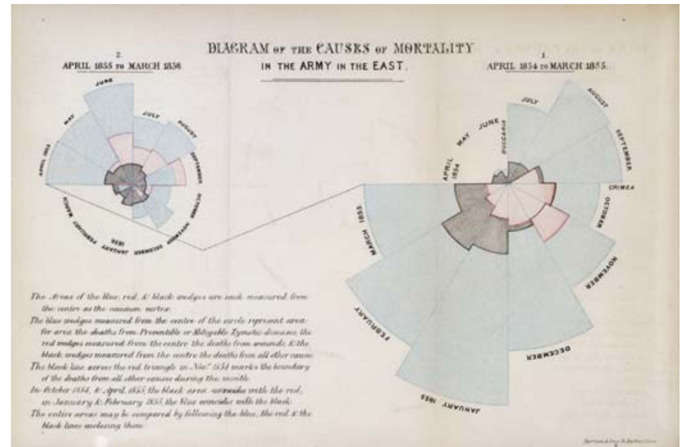
Methods. Demographic, clinical, and mortality data were collected of all children who were admitted via interfacility transport to our regional, academic, tertiary-care level children's hospital during an 18-month period. A commercially sold CPOE program that operated within the framework of a general, medical-surgical clinical application platform was rapidly implemented hospital-... during this period. Retrospective anal-... post-CPOE implementation time ... months after CPOE

computer software, health care delivery/access, interhospital transport, outcome.

ABBREVIATIONS. CPOE, computerized physician order entry; CHP, Children's Hospital of Pittsburgh; ADE, adverse drug event; PRISM, Pediatric Risk of Mortality; OR, odds ratio; CI, confidence interval.

In their landmark report *To Err is Human: Building a Safer Health System*, members of the Institute of Medicine estimated that medical errors contributed to between 44 000 and 98 000 deaths annually in the United States.[1] As a result of this report, subse-quent congressional hearings, and extensive medi-... exposure, the issue of patient safety has quickly rise-... to a position of highest priority among many heal-... care organizations. Sparked by this "safety ini-tive," many hospitals have looked toward emerg-... medical information technologies, specifically ... physician order entry (CPOE) system ... to reduce human error during ...





Crimean war
British deaths, 1854