Chapter 13: What will it take to fix health care?

263. This note calculates the number of deaths due to health care each year in the United States, including those from hospital-related infections, blood clots, and medical errors and from adverse drug events both in and out of the hospital. Discussion follows the details.

Infections Due To Hospital Care

"Data and Statistics: HAI Prevalence Survey," Centers for Disease Control and Prevention, http://www.cdc.gov/HAI/surveillance/, quoting a *New England Journal of Medicine* study, "Multistate Point-Prevalence Survey of Health Care-Associated Infections," published 27

March 2014, which concluded that about 722,000 people pick up infections in hospitals every year, and 75,000 of them die as a direct result.

Blood Clots Due To Hospital Care

John A. Heit, Alexander T. Cohen, and Frederick A. Anderson, Jr., on behalf of the VTE Impact Assessment Group, "Estimated Annual Number of Incident and Recurrent, Non-Fatal and Fatal Venous Thromboembolism (VTE) Events in the US," *Blood* 2005 (American Society of Hematology (ASH) Annual Meeting Abstracts) Abstract #910.

This document reports 189,819 total fatalities annually from deep vein thrombosis and pulmonary embolisms related to hospital care, so 190K is used in the text.

See also Laura Landro, "In the Hospital, Facing a Scourge of Killer Clots," *Wall Street Journal*, 01 April 2009: "Deep-vein thrombosis followed by pulmonary embolism . . . kills nearly 200,000 U.S. patients a year."

Heit and fellow researchers provided the following annualized counts of blood clots of two types (pulmonary embolism or PE and deep vein thrombosis or DVT), separated into fatal and non-fatal instances and whether they arose from hospitalization or not:

Blood clots in the U.S.

Type	Hospital	Community	Total
Non-Fatal DVT	268,125	108,240	376,365
Non-Fatal PE	151,700	85,358	237,058
Total Non-Fatal	**419,825**	**193,598**	**613,423**
Fatal DVT	1,609	649	2,258
Fatal PE	188,210	105,902	294,112
Total Fatal	**189,819**	**106,551**	**296,370**
Grand Total	**609,644**	**300,149**	**909,793**

Medical Errors in Hospitals

"HealthGrades Quality Study Patient Safety in American Hospitals 2004," reports, "excluding obstetric patients, we calculated that over 575,000 preventable deaths occurred . . . in U.S. hospitals from 2000 through 2002."

Please note three points: first, this calculation excludes obstetrics. Second, these are problems from *preventable* deaths from medical errors; most of the other calculations do not distinguish between preventable and non-preventable deaths, so these numbers are lower than they would be if they were consistent in structure with the rest of the numbers used. Third, there is overlap with infections and blood clots here; these double counts are subtracted out later, below.

The HealthGrades study identifies deaths due to the following problems: accidental puncture or laceration, complications of anesthesia, death in low mortality Diagnostic Related Grouping (DRGs), decubitus ulcer (bedsores), failure to rescue, foreign body left

during procedure, iatrogenic pneumothorax (collapsed lung), selected infections due to medical care, transfusion reaction, and these post-operative complications: hemorrhage or hematoma, hip fracture, physiologic and metabolic derangement, pulmonary embolism or deep vein thrombosis (blood clots), respiratory failure, sepsis, and wound dehiscence.

See also Laura Landro, "Report Card to Rank Hospitals on Safety," *Wall Street Journal*, 22 April 2004: "The incidence of medical errors is higher than some patients might think. The Institute of Medicine reported in 2000 that medical errors cause as many as 98,000 deaths annually, but some safety experts now say the report actually understates the problem. . . . A more realistic number may be as high as 200,000 deaths per year.'"

Paul Davies, "Fatal Medical Errors Said To Be More Widespread," *Wall Street Journal*, 27 July 2004: "A new study coming out today . . . estimated that medical errors in U.S. hospitals contributed to almost 600,000 patient deaths over the past three years, double the number of deaths from a study published in 2000 by the Institute of Medicine."

Based on the above, 200K is used in the text.

Medication Side Effects

Three studies are highlighted below.

Saul Weingart, Ross McL. Wilson, Robert W. Gibberd, and Bernadette Harrison, "Epidemiology of Medical Error," *BMJ*, 18 March 2000: Adverse drug events among people not in hospitals "accounted for . . . 199,000 additional deaths."

Frank R. Ernst and Amy J. Grizzle, "Drug-Related Morbidity and Mortality: Updating the Cost-of-Illness Model," *Journal of the American Pharmaceutical Association*, March/April 2001, reports that side effects of drugs in people not in hospitals accounted for 218,113 deaths.

Both of these studies also reported other consequences of side effects, listed below.

Side effects of medicines in patients who are not hospitalized

Result of drug side effects	Weingart	Ernst	Average
Physician visits	116,000,000	126,846,567	**121,423,284**
Additional prescriptions	76,000,000	83,735,556	**79,867,778**
Emergency dept visits	17,000,000	18,703,833	**17,851,917**
Hospital admissions	8,000,000	9,609,722	**8,804,661**
Long-term care admissions	3,000,000	3,454,460	**3,227,230**
Deaths	199,000	218,113	**208,557**

Jason Lazarou, Bruce Pomeranz, and Paul N. Corey, "Incidence of Adverse Drug Reactions in Hospitalized Patients: A Meta-Analysis of Prospective Studies," *JAMA*, 15 April, 1998: "We estimate that in 1994, . . . 106,000 . . . [hospitalized patients] had fatal ADRs [adverse drug reactions] making these reactions between the fourth and sixth leading cause of death." They note that the 106,000 reflects a range of 76,000-137,000. This study defines an adverse drug reaction more narrowly than other studies define adverse drug events.

Taking together the average of the deaths due to drug side effects in non-hospitalized patients from the chart above and Lazarou's numbers for hospitalized patients yields:

Deaths due to side effects of medicines		
Non-Hospitalized (average)	**Hospitalized**	**Total**
208,557	106,000	**314,557**

Discussion

One must subtract possible double counts in the medical error numbers. To do so, I used the deaths for Medicare patients attributable to infections and blood clots included in the HealthGrades medical error numbers—HealthGrades being the only one of the studies that offered this level of detail—and, using the HealthGrades estimate that 45 percent of the relevant hospital population is on Medicare, grossed these deaths up to estimate the numbers for the total population that may be double counted as follows:

Possible double counts	
Blood clots	19,000
Infections	8,000
Sepsis	11,000
Total possible double counts	38,000

I included the sepsis number to be safe, although it may not in fact be a double count. Using the lower number for non-hospitalized patient deaths due to drug side effects, and subtracting possible double counts, at a minimum the numbers are:

Total deaths due to selected health care causes	
Type	**Number/Year**
Medical errors in hospitals	200,000
Blood clots in hospitals	190,000
Infections in hospitals	75,000
Drug side effects in hospitals	106,000
Drug side effects not in hospitals	199,000
Subtotal—selected causes	**770,000**
Less possible double counts	(38,000)
Net total—selected causes	**732,000**

Compare these numbers to the leading diseases listed as causes of death nationally:

Top four diseases causing death	
Heart disease	596,000
Cancer	575,000
Chronic lower respiratory diseases	143,000
Stroke	129,000

The data on deaths (rounded) comes from Donna L. Hoyert and Jiaquan Xu, "Deaths: Preliminary Data for 2011," National Vital Statistics Reports, 10 October 2012, found at http://www.cdc.gov/nchs/data/nvsr/nvsr61/nvsr61_06.pdf.

Note that the number of 732,000 deaths calculated above due to side effects and complications of health care means that health care is the leading cause of death in America, by a wide margin. According to the same federal government report noted above, about 2.513 million people die each year in America. Thus, 29 percent of all deaths in this country appear to be caused by medical care.

Of course, everyone dies of something—eventually—but in many cases, deaths resulting from health care come years or even decades before the individuals would be expected to die were it not for side effects and complications.

Exclusions from the Count of Deaths Due to Health Care

Except for drug side effects, the figures above are hospital-based. Little research has been done on the harm that health care causes outside of the hospital. However, consider Tara F. Bishop, Andrew M. Ryan, and Lawrence P. Casalino, "Paid Malpractice Claims for Adverse Events in Inpatient and Outpatient Settings," *JAMA*, 15 June 2011. They observed that roughly equal numbers of malpractice claims were paid for inpatients and for outpatients in the U.S. in the five years ending in 2009. The authors suggest that health care may result in as much harm outside of hospital settings as inside.

About 12 million people suffer adverse events in the hospital, derived as follows: the Institute for Healthcare Improvement concluded that about a third of the time when people were in the hospital, they experienced at least one adverse event. See Donald M. Berwick, plenary presentation "Mont Sainte-Victoire" at the Institute for Healthcare Improvement 18th Annual National Forum on Quality Improvement in Health Care, Orlando, FL, 12 December 2006.

Counting only the 37 million inpatient stays (that is, ignoring the 130 million emergency room visits and the 101 million hospital outpatient visits), the above means that over 12 million people a year suffer an adverse event in the hospital.

If an equal number, or 12 million, are harmed outside hospitals, one might then want to know how many of them die. If the patterns revealed in the Institute for Healthcare Improvement research apply outside the hospital, about 11% of these events might cause permanent harm (including death). But research is not available to confirm this very rough estimate that is suggested here simply to help frame the discussion.

Consider also Tara Parker-Pope, "Testing Mistakes at the Family Doctor," *New York Times*, 14 August 2008. The article mentions in passing that "medical errors or adverse events in family practices occur in about one in four patient visits," but does not identify the studies that led to that conclusion or indicate how serious the errors are.

As noted in Chapter 7, one recently published study estimated deaths due to misdiagnosis as roughly 40,000 to 80,000 people per year. See Mark L. Graber, Robert M. Wachter, and Christine K. Cassel, "Bringing Diagnosis Into the Quality and Safety Equations," *JAMA*, 26 September 2012.

According to Dr. Wes Ely, a leading researcher in the field of hospital-related delirium, in the first six months after discharge, people who developed delirium in the hospital die at three times the rate of a matched cohort whose members did not develop delirium in the hospital. See E. Wesley Ely, "ICU Delirium Epidemiology, Monitoring, & Manage-

ment," slide presentation, 2006. http://www.mc.vanderbilt.edu/icudelirium/docs/ICU_slides_02_2006.pdf.

Deaths that result directly from mistakes such as misdiagnosis or hospital-acquired delirium may occur weeks or months after the episode of care in which the mistake or error in care took place. These deaths are not included above in the calculations of deaths caused by health care.

The list goes on. For example, infections or medical errors that kill people at other sites such as nursing homes are not included in the counts.

Despite these obvious omissions, I have not added estimates for deaths caused by side effects and complications outside of hospitals, except for the adverse drug events specifically listed separately above. The numbers that are included should be sufficient to make the point: a very large number of people are injured or killed by the care they receive.