Exnovation, De-Adoption, and the Sustainability of US Health Care

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Innovation & diffusion: fascinating research topics

Getting Rid of Ineffective Technologies
After some period of time (often more than a decade), and ever so gradually, an erosion of support begins to set in. The enthusiastic claims made for the innovation during its earlier stages are modified somewhat; it is not as universally applicable as once thought; it is useful only for certain groups of the population, or particular types of or stages in an illness.

John B. McKinlay, Milbank Memorial Fund Quarterly, 1981
Scott’s Parabola

Promising Idea


Mills, Eyenet, 2011
Scott’s Parabola

Encouraging reports


Mills, Eyenet, 2011
Scott’s Parabola

The rise and fall of a surgical technique

PROMISING IDEA

- Of possible value— but only as a research tool
- Encouraging reports
- Strong media pressure for universal acceptance
- Widespread enthusiasm

Standard treatment

- General introduction
- Doubts creep in
- Widely publicized medicolegal case
- Damaging survey reported
- Condemned by several authorities

Falls into disuse

Used only in highly specialized circumstances

Operating theater staff ponder possible uses for large quantities of expensive, obsolete equipment

Very old surgeons amaze their juniors with rollicking stories of the old days


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Problem: The “protracted” use of old technology

De-adoption and exnovation in the use of carotid revascularization: retrospective cohort study
Kimon Bekelis, Jonathan Skinner, Daniel Gottlieb, Philip Goodney

Annals of Internal Medicine

Faded Promises: The Challenge of Deadopting Low-Value Care
Benjamin R. Roman, MD, and David A. Asch, MD, MBA

Medical Care
August 1992, Vol. 30, No. 8

The Protracted Demise of Medical Technology

Original Investigation | LESS IS MORE
Effect of Published Scientific Evidence on Glycemic Control in Adult Intensive Care Units
Daniel J. Niven, MD, MSc; Gordon D. Rubenfeld, MD, MSc; Andrew A. Kramer, PhD; Henry T. Stelfox, MD, PhD
De-adoption: When providers drop the use of a procedure entirely [Nivens et al., JAMA IM, 2016]

Exnovation: When providers scale back on the use of a procedure

- Health care: Bekelis et al., 2017; Rodriguez et al., 2016
- Energy policy: de Hoop et al., 2014; Heyen et al. (2018);
- Management: Frost et al. (2015); Kimberly (1981)
Gradual “exnovation” in carotid endarterectomy

De-adoption and exnovation in the use of carotid revascularization: retrospective cohort study

Kimon Bekelis, Jonathan Skinner, Daniel Gottlieb, Philip Goodney
Asymptomatic or age 80+: Similar rate of decline!
MDs exnovate less when ICDs are “bread & butter”

De-adoption and exnovation in the use of carotid revascularization: retrospective cohort study

Fig 2 | Correlation of specialty practice share of carotid revascularization with risk adjusted rate of exnovation (r=0.986, P<0.001)
Another example: Implantable Defibrillators (ICDs)
Overconfidence in the Diffusion of Technology

Diffusion and exnovation for ICD use, 2006-13

Rates per 100 Enrollees


SF, Miami, Savannah, Terre Haute, McAllen, Seattle, US
Sustainability: How to pay for new treatments?

How CRISPR works

1. The Cas9 protein forms a complex with guide RNA in a cell

2. This complex attaches to a matching genomic DNA sequence adjacent to a spacer (yellow segment)

3. The Cas9-RNA complex cuts the double strands of the DNA

4. Programmed DNA may be inserted at the cut

Credit: MRS Bulletin
How do you make room for new clothes?
Medicare inpatient surgical rates / 1000 enrollees

Source: www.dartmouthdiffusion.org
Medicare inpatient surgical rates / 1000 enrollees

Inflation-adjusted per-enrollee Medicare spending growth, 2006-2014: 0%
Summing Up

- *De-adoption* and *exnovation*: Increasingly important issues for patient quality and fiscal sustainability
- “Choosing Wisely” is like de-adoption, but just a tiny fraction of total spending
- Exnovation: More difficult to monitor and regulate, but far more in potential revenue savings