Translating Evidence from Research to Practice for Select Interventions in Cancer Control

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Background

The slow transfer of research evidence to practice is a problem that is widely recognized by researchers, practitioners, policy makers, and patients. According to a review published in 2000 by Balas and Boren, it takes an average of **17 years** for research evidence to reach clinical practice (50% uptake). This finding, published 17 years ago, was based on nine medical procedures in the 1980s. Despite the frequent use of this statistic to highlight the problem of slow research translation, we do not know its relevance to cancer research nor to more recent trends. We explore the amount of time it takes for translation of research to uptake of evidence-based practice in cancer. Our objective was to determine the time it took for evidence from the seminal publication to reach at least 50% uptake in the target population.

Methods

We included evidence-based programs, practices, or interventions (herein referred to as EBPs) in cancer prevention and screening with professional guidelines and population-based data on uptake. We included five EPBs: clinicians' advice to quit smoking, HPV vaccination, HPV testing, colorectal cancer screening, and mammography. To determine the time from research publication to implementation, we identified the seminal study, defined as a published article that provided sufficient evidence for the effectiveness of the EBP. All but one of our EBPs had an RCT as the seminal study. The exception, HPV testing, was an observational study. Next we identified professional guidelines issued wholly or in part by a government agency that were concordant with the findings of the seminal study. We also searched for systematic reviews to determine if the evidence from the seminal study had been incorporated into the review. The data on uptake of the EBP was reviewed for all years where available, to follow any trends.

We calculated the number of years from publication of the seminal study to initial publication of the guideline to implementation, defined as 50% uptake in the population for which that EBP was recommended. We also calculated the average number of years to implementation for all five EBPs. We also traced other important events along the pathway to implementation that occurred after the seminal study and contributed to the development of the full evidence base leading to a guideline or a review.

EBP Implementation Timelines

The timelines for each EBP represent different events along the pathway to implementation and the data on uptake that was available either prior to reaching 50% uptake or after reaching 50% uptake.

Clinicians' Advice to Quit Smoking

1979	1992	1996	2000	2003	2008	2008	2009	2011
Publication	**Uptake**	**Joint Guidelines**	**Joint Guidelines**	**Uptake**	**Joint Guidelines**	**Cochrane Review**	**USPSTF Guidelines**	**Current Uptake**
Trial showed clinicians' advice to stop smoking with a leaflet and warning about follow-up was most effective compared to advice only and non-intervention controls	Percentage of smokers age 18+ who have seen a physician in the past year and were advised to quit smoking is **51.2%**	First guideline issued by Agency for Health Care Policy Research (AHCPR) recommends primary care clinicians identify and treat smokers with cessation or motivational intervention.	AHCRP update to the 1996 guidelines	Percentage of smokers age 18+ who have seen a physician in the past year and were advised to quit smoking is **61.8%**	AHCRP update to the 2000 guidelines	Pooled data from 17 trials of brief advice versus no advice (or usual care) detected 66% increase in quitting rates	Recommend clinicians ask all adults about tobacco use and provide tobacco cessation interventions for those who use tobacco products	Percentage of smokers age 18+ who have seen a physician in the past year and were advised to quit smoking is **64.3%**

HPV Vaccination

2002	2006	2006	2008	2009	2011	2012	2016	2016
Publication	**FDA Approval**	**CDC Recommendation**	**Uptake**	**FDA Approval**	**CDC Recommendation**	**Uptake**	**CDC Recommendation**	**Current Uptake**
HPV-16 vaccine reduced incidence of HPV-16 infection and HPV-16–related cervical intraepithelial neoplasia (CIN)	Gardisil vaccine licensed for use among females aged 9-26 years	Advisory Committee on Immunization Practices (ACIP) recommends routine vaccination of females aged 11--12 years with 3 doses of quadrivalent vaccine (HPV4)	Percentage of females receiving 3+ doses of the vaccine was **16.6%**	Gardisil vaccine licensed for use among males aged 9-26 years	ACIP recommends routine vaccination of males aged 11-12 years with 3 doses of HPV4	Percentage of males receiving 3+ doses of the vaccine was **6.8%**	ACIP revised recommendation for a 2-dose vaccination schedule for girls and boys who initiate the vaccination series at ages 9 through 14 years	Percentage of females receiving 2+ doses was **49.5%**

HPV Testing for Cervical Cancer

1999	2000	2003	2004	2007	2012	*2012*	*2022**
Publication	**Systematic Review**	**FDA Approval**	**Joint Guidelines**	**Uptake**	**USPSTF Guidelines**	**Uptake**	***Projected Uptake**
HPV DNA detection precedes and predicts the first cytologic detection of squamous intraepithelial lesions	HPV testing is more sensitive than cytology and has great potential as a primary screening test	Approval of clinical test for HPV to be used in cervical cancer screening	The ACS, ASCCP, and NCI issued an interim guidance for concurrent HPV and cytology testing ("co-testing") every 3 years for women age 30+	**5.2%** is based on the New Mexico HPV Pap Registry	Recommend screening with combination of cytology and HPV testing every 5 years for women age 30-65	**19.1%** is based on the New Mexico HPV Pap Registry	We estimate uptake will reach 50% in 2022 if use of HPV testing continues to increase at the current rate

Colorectal Cancer Screening

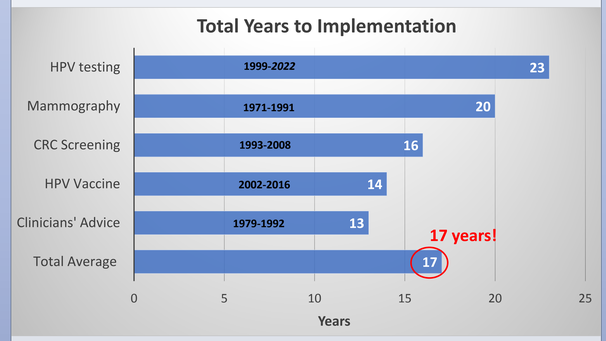
1993	1996	1997	2000	2002	2007	2008	2008	2016	2016
Publication	**USPSTF Guidelines**	**Joint Guidelines**	**Uptake**	**Revised USPSTF Guidelines**	**Cochrane Review**	**Revised USPSTF Guidelines**	**Uptake**	**Revised USPSTF Guidelines**	**Current Uptake**
First RCT providing evidence that screening via fecal occult blood test (FOBT) reduces mortality by 33%	Recommend FOBT or sigmoidoscopy for men and women aged 50+	Agency for Health Care Policy Research (AHCPR) task force called for universal screening for men and women age 50+	Percentage who received FOBT in past year, sigmoidoscopy in past 5 years, or colonoscopy in past 10 years is **38.2%**	*Strongly* recommend screening men and women age 50+	FOBT screening is likely to avoid approximately 1 in 6 colorectal cancer deaths	Recommend FOBT, sigmoidoscopy, or colonoscopy in men and women age 50+	Percentage who received FOBT in past year, sigmoidoscopy in past 5 years, or colonoscopy in past 10 years is **53.6%**	Recommend screening men and women age 50-75	Percentage who received FOBT in past year, sigmoidoscopy in past 5 years, or colonoscopy in past 10 years is **62.8%**

Mammography

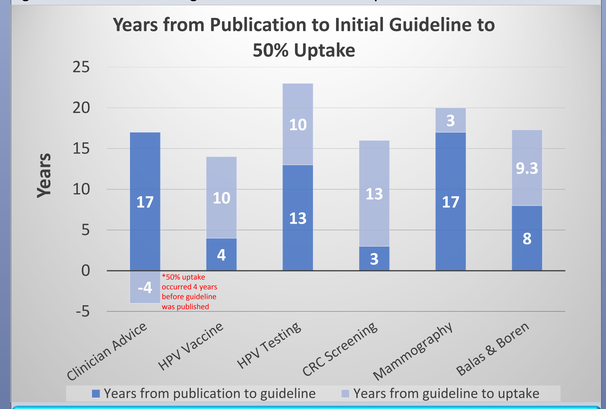
1971	1980	1987	1988	1991	2001	2009	2015
Publication	**Guidelines**	**Uptake**	**Joint Guidelines**	**Uptake**	**Cochrane Review**	**USPSTF Guidelines**	**Current Uptake**
HIP Trial finds screening reduces breast cancer mortality by **30%**	First Guidelines issued by American Cancer Society (ACS) recommends annual screening for women ages 50+	Women (ages 50-74) receiving mammography within past 2-years reported at **30%**	Issued by ACS, American College of Radiology, and NCI recommends annual screening for women ages 50+	Women (ages 50-74) receiving mammography within past 2-years reported at **50%**	Reviewed the effect of mammography screening on mortality and morbidity; found no evidence for a survival benefit from mass screening	Screening mammography every 1-2 years for women ages 50-74	Women (ages 50-74) receiving mammography within past 2-years reported at **71.5%**

Results

Our findings highlight the complexity of piecing together the pathway from research to implementation to measure time it takes for implementing an EBP in cancer prevention and screening. The total number of years to implementation vary and average 17 years.



Our examples demonstrate that the path to research translation is not linear and each stage builds to inform the next. As more evidence accumulates and contributes to the formation of revised guidelines, we get closer to achieving substantive rates of uptake.



Limitations

We included only five EBPs because data was limited on uptake over time, and for many EBPs, the evidence changed so rapidly that it was impossible to trace uptake before the evidence and subsequent guidelines changed.

Implications and Future Research

We measured the time from publication to implementation, defined as 50% uptake, for select EBPs in cancer control. We found similar results to Balas and Boren's from 2000 that it takes 17 years. All interventions except HPV testing have reached substantial uptake to date. We encourage investigators to explore ways to increase the rate of uptake of HPV testing and other EBPs in cancer control.

Data Sources

- NCI Cancer Trends Progress Report
- State Cancer Profiles
- U.S. Preventive Services Task Force recommendations
- CDC Morbidity and Mortality Weekly Report (MMWR)
- AHCPR (AHRQ) Guidelines
- PubMed, Google Scholar to identify seminal publications and systematic reviews
- Food and Drug Administration (FDA) Pre-Market Approval letter for HPV DNA Test
- NCI and FDA staff expert opinion

Seminal Publications

- Russell MAH, Wilson C, Taylor C, Baker CD. (1979) Effect of general practitioners' advice against smoking. *BMJ*, *2*(6184).
- Liaw KL, Glass AG, Manos MM, et al. (1999) Detection of human papillomavirus DNA in cytologically normal women and subsequent cervical squamous intraepithelial lesions. *JNCI*, *91*(11).
- Koutsky LA, Ault KA, Wheeler CM, et al. (2002) A controlled trial of a human papillomavirus type 16 vaccine. *NEJM*; 347(21).
- Mandel JS, Bond JH, Church TR, et al. (1993) Reducing mortality from colorectal cancer by screening for fecal occult blood. Minnesota Colon Cancer Control Study. *NEJM* 328 (19).
- Shapiro S, Strax P, Venet L. (1971) Periodic Breast Cancer Screening in Reducing Mortality From Breast Cancer. *JAMA*. 215(11).