Adoption of dental innovations

The case of a standardized dental diagnostic terminology

Rachel B. Ramoni, DMD, ScD; Jini Etolue, DDS, MPH; Oluwabunmi Tokede, DDS, MPH; Lyle McClellan, DDS; Kristen Simmons, RDH, MHA; Alfa Yansane, PhD; Joel M. White, DDS, MS; Muhammad F. Walji, PhD; Elsbeth Kalenderian, DDS, MPH, PhD

Some new things catch on, and others do not. As Gawande[1] pointed out, anesthesia and antisepsis, 2 bedrock elements of the practice of dentistry, had different diffusion trajectories. Once it was demonstrated publicly, ether anesthesia spread across the world in a matter of months, whereas antisepsis took a generation to become common practice. Here, we are going to consider the adoption of a standardized dental diagnostic terminology (SDDxT) through the lens of innovation diffusion.

Supplemental material is available online.

Without innovation, there would be no progress, and dentistry certainly has enjoyed a lot of progress over the millennia.[2] We are grateful for that. If not, modern-day dentists might be using the bow drill tipped with a flint head used in the Neolithic age instead of the high-speed handpiece.[3] In 1957, the Borden Airotor, a high-speed air turbine contra-angle handpiece, was introduced.[4] By 1962, more than 90% of dentists were using a turbine contra-angle handpiece.[5-7] Like Gawande's anesthesia example, this innovation was greeted with rapid, full adoption.

The implant is another innovation in dentistry that has been adopted widely, though its trajectory was more like that of antisepsis.[1] The first titanium dental implant was placed in a person in 1965, at Brånemark's clinic in Gothenburg, Sweden. Four years later, the American Dental Association (ADA) position was that

ABSTRACT

Background. Standardized dental diagnostic terminologies (SDDxTs) were introduced decades ago. Their use has been on the rise, accompanying the adoption of electronic health records (EHRs). One of the most broadly used terminologies is the Dental Diagnostic System (DDS). Our aim was to assess the adoption of SDDxTs by US dental schools by using the Rogers diffusion of innovations framework, focusing on the DDS.

Methods. The authors electronically surveyed clinic deans in all US dental schools (n = 61) to determine use of an EHR and SDDxT, perceived barriers to adoption of an SDDxT, and the effect of implementing an SDDxT on clinical productivity.

Results. The response rate was 57%. Of the 35 responses, 91% reported using an EHR to document patient care, with 84% using axiUm; 41% used the DDS. Fifty-four percent of those who did not use an SDDxT had considered adopting the DDS, but 38% had not, citing barriers such as complexity and compatibility.

Conclusions. Adoption of an SDDxT, particularly the DDS, is on the rise. Nevertheless, a large number of institutions are in the Rogers late majority and laggards categories with respect to adoption. Several factors may discourage adoption, including the inability to try out the terminology on a small scale, poor usability within the EHR, the fact that it would be a cultural shift in practice, and a perception of unclear benefits. However, the consolidation of the DDS and American Dental Association terminology efforts stands to encourage adoption.

Practical Implications. The successful adoption of dental innovation depends not only on the intrinsic merit of the innovation, as some useful innovations do not achieve widespread traction. As such, it is important for health care providers to understand how to disseminate their ideas in order to ensure traction and widespread adoption.

Key Words. Diffusion of innovation; terminology; dental schools; electronic health records.

JADA 2017:148(5):319-327

http://dx.doi.org/10.1016/j.adaj.2017.01.024

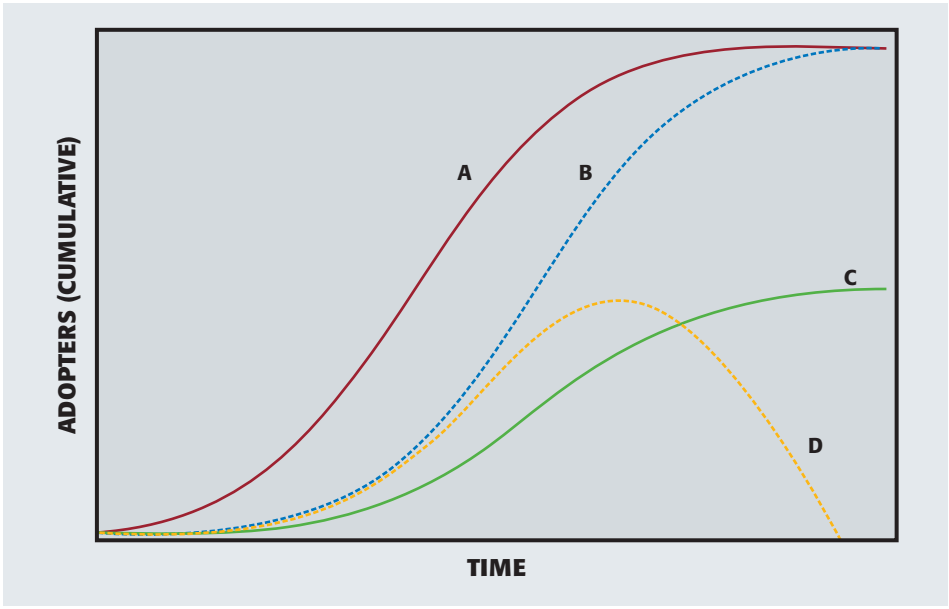

Figure 1. Adoption outcomes. A: Full adoption. B: Late full adoption. C: Partial adoption. D: Rejection. *Reproduced with permission of the publishers from Greenhalgh and colleagues.*[13]

TABLE 1

Five attributes that can affect diffusion.*

ATTRIBUTE	DESCRIPTION
Relative Advantage	The degree to which an innovation is perceived as being better than the idea it supersedes.
Compatibility	The degree to which an innovation is perceived as consistent with the existing values, past experiences, and needs of the potential adopter.
Complexity	The degree to which an innovation is perceived as relatively difficult to understand and use.
Trialability	The ability for the innovation to be tried or used in a test mode on a small scale.
Observability	The ability for the outcome of an innovation to be observed and measured easily by others.

* Source: Rogers.[5]

these devices were highly experimental.[8] The turning point came in 1982 at the Toronto Conference on Osseointegration in Clinical Dentistry,[9] where Brånemark's team presented the scientific evidence and clinical success of osseointegration to educational leaders in the fields of oral surgery and prosthodontics from North American schools. That same year, the US Food and Drug Administration approved the use of titanium dental implants. By 2006, US dentists had placed 5,505,720 implants.[10]

Not all innovations ultimately are embraced. Consider the rubber dam.[5] Centuries after its invention, it is not broadly used.[11] In a study, researchers from The Dental Practice-Based Research Network found that among practitioners only 44% always used a rubber dam when performing endodontic therapy and 63% never used a rubber dam for restorative treatment.[11] This partial adoption is vexing because patient harm can be prevented through the use of the rubber dam, by decreasing the chance of aspiration and contamination. In addition, there is some evidence that rubber dams may reduce restoration failure rates.[12]

How can we describe adoption of an innovation? We have covered examples of full adoption, late full adoption, and partial adoption. In addition to these, there is rejection. Together, as Figure 1[13] shows, these are the 4 archetypal diffusion trajectories.

Why do some things catch on quickly, but others do not? To be sure, the diffusion of an innovation depends on its characteristics. Rogers identified 5 attributes that can affect diffusion: relative advantage, compatibility, complexity, trialability, and observability (Table 1).[5] In brief, an innovation that is perceived to have an advantage over the current technology or idea, is easy to use, is consistent with existing values and experiences, can be experimented with on a small scale, and has easily observed results will be more likely to be adopted.[6]

With that said, the so-called diffusion of innovations does not depend only on the innovation itself but also on its communication channels, time, and the people who make up the system interacting with the innovation. In the case of antisepsis, there were prominent people who simply could not believe that a physician's hand

ABBREVIATION KEY. **ADA:** American Dental Association. **DDS:** Dental Diagnostic System. **EHR:** Electronic health record. **GD:** General dentistry. **ICD:** International Classification of Diseases. **SDDxT:** Standardized dental diagnostic terminology. **SNODDS:** Comprehensive dental diagnostic terminology for use in electronic health record user interfaces. **SNODENT:** Systematized Nomenclature of Dentistry. **SNOMED CT:** Systematized Nomenclature of Medicine Clinical Terms.