Implementation science, often termed implementation research, stands at the nexus of theory and practice. This multidisciplinary arena emphasizes the systematic exploration of strategies that facilitate the seamless integration of evidence-based interventions, practices, or innovations into real-world settings, particularly in healthcare environments like hospitals.

The primary objective is to narrow the chasm between empirical research and pragmatic application. This endeavor necessitates the scrutiny of a myriad of variables, ranging from the dynamics among healthcare professionals, the interplay of institutional policies and the patients' perspectives to the overarching infrastructure of the healthcare ecosystem. The ultimate ambition is to craft strategies that accentuate the advantages of new technologies while minimizing potential impediments.

Key aspects of implementation science when rolling out new technologies in hospitals include:

1. **Evidence Evaluation:** A deep dive into the existing scientific literature to gauge the efficacy, safety, and applicability of the technology in question, identifying any gaps or lacunae that need to be addressed.

2. **Barrier & Facilitator Identification:** Recognizing potential hindrances and accelerators for implementation. These variables can range from technical details and the way in which an organization thinks and acts to the bigger picture of how the healthcare system works.

3. **Strategizing for Implementation:** Designing and validating strategies that bolster the adoption and ongoing utilization of new technologies. This often involves training modules, policy amendments, workflow tweaks, innovative study design, and enhanced communication mechanisms.

4. **Outcome Assessment:** Measuring the real-world impact of implementation strategies, gauging metrics such as adoption rate, fidelity to original design, and long-term sustainability.

5. **Scale-up & Dissemination:** Following the identification of efficacious strategies, the focus shifts to amplifying the technology’s reach across diverse healthcare settings, buttressed by well-designed dissemination blueprints and guidelines.

By embracing the methodologies of implementation science, healthcare institutions stand poised to augment patient outcomes through the adept introduction of new technological paradigms.

**Real-world Case Studies & Insights**

**Dr. Guid Oei’s own PhD research project in the 1990s, which focused on the effectiveness of the postcoital test introduced by Dr. Sims in the nineteenth century, exemplifies the challenges associated with implementation. Under the guidance of Prof. Marc Keirse, a vanguard in the evidence-based medicine domain, Oei embarked on a novel randomization approach. Though the test was found redundant and was swiftly phased out in the US, the Netherlands witnessed an 18-year lag in its discontinuation - a testament to the intricacies of de-implementation.**

Historically, the cholera epidemic in 1844 sheds light on implementation disparities. Dr. Eugene Sue’s revelations in Paris linking cholera to hygiene weren’t enough to prevent an outbreak in the small village of Lambrey in the Haute Saône more than a decade later, leading to hundreds of unnecessary deaths.

It seems that local conditions where the implementation takes place play a crucial role in the speed of implementation. The delay in the Netherlands in discontinuing the postcoital test as part of fertility examinations can be

---

**Figure 1:** Application of the consolidated framework for implementation research to the obstetric hemorrhage bundle. Invented by Dr. Sims.
In this context, Laura Damschroder’s ‘Consolidated Framework for Implementation Research’ (CFIR) stands out as a beacon. The CFIR meticulously demarcates potential factors under five broad domains that can influence implementation:

+ Intervention Characteristics
+ Outer Setting
+ Inner Setting
+ Characteristics of Individuals
+ Process

A case in point is Rebecca Hamm’s foray into obstetrics. The introduction of an ‘obstetric haemorrhage bundle’ bore contrasting results in Pennsylvania and California. The defining difference? California’s recourse to the CFIR framework. Apart from the CFIR, other frameworks for implementation have been developed and validated as well. It probably doesn’t matter much which framework you use; what’s more important is to have a framework in the first place.

**Key Takeaways:**
1. The indispensability of a structured framework.
2. The imperative of stakeholder engagement.
3. The weightage of qualitative research.
4. The importance of documentation and knowledge dissemination.
5. Gleaning insights from real-world scenarios.

Attributed to several influential conservative fertility professors who found it challenging to let go of the postcoital test. Conversely, the later implementation of hygiene measures in rural France compared to Paris can be attributed to political decisions. More disconcertingly, cholera’s presence in contemporary regions like Malawi underscores the disparity in implementation speeds based on location.

Mark Buxer’s treatise on implementation science delves into the nuanced differences between controlled research environments and the unpredictable real world. Transitioning from efficacy (conceptual effectiveness) to proving its effectiveness in varied settings and finally to actual implementation demands an understanding of a multitude of external variables. The crux of implementation science pivots on not just gauging the impact of an innovation but more pertinently, on discerning the multifarious elements influencing its day-to-day adoption.

**HARMONIZING MEDICINE AND ENGINEERING: TEAMWORK IN CLINICAL RESEARCH AND IMPLEMENTATION**

Ivar de Vries MSc, Phebe Berben MD, Nadine de Klerk MD, Midwife Physician Assistant Sofie van Weelden, Marion Frenken MD, PhD students of Máxima Medical Center and Eindhoven University of Technology

In the world of medicine, technology is assuming an increasingly significant role. The collaboration between technician and clinician in this process is essential. This collaboration can be challenging, but when optimized it will give new opportunities. The different aspects within this collaboration will be further illustrated in order to harmonize medicine and engineering in scientific research and clinical implementation.