

Top 8 Medical & Tech Innovations of 2017



By *Jamie Wells, M.D.* — December 14, 2017



Host Bianca Chen, ACSH Director of Medicine Dr. Jamie Wells (on right)

Recently, I had the pleasure of filming a segment on the top medical, science and technology innovations of 2017 at Reuters TV in Times Square, New York with host of CCTV Bianca Chen (video clip forthcoming).

It was an exciting year in the pursuit of the once impossible when it comes to medical developments. Here are some top picks that genuinely are changing the landscape:

1) Cancer

Immunotherapy takes the top spot as personalized treatments approach cancer cure in a whole new way. This year, there has been success in its use in leukemia and lymphoma, and now solid tumors are being added to the slate. Time will tell if the latter group will yield similar promising results. Though in its relative infancy, the achievements are being published with [greater](#) ^[1] and greater frequency.

Traditional chemotherapy functions indiscriminately, annihilating both the bad cancer cells and good cells we need to maintain ideal health. The death of those cells produces a range of side effects, and often those ill effects are not well-tolerated to dangerous. And, the treatment depending on the cancer type is one-size-fits-all.

With **CAR T cell therapy** (chimeric antigen receptor), doctors take a patient's cells and perform some magic, place them back inside the patient where they have been tailor-made to find and attack cancer cells. It is fundamentally a revved-up process that enables a patient's immune system to handle the foreign invader. CAR T can have very serious consequences for some, and not everyone achieves the desired result which is why it is offered only at specific academic

centers where staff is well-trained to catch adverse effects early.

- Tumors shed DNA into the circulation. A particularly promising new technique, *liquid biopsy*, identifies that DNA in our blood and may provide a less invasive, earlier cancer detection than conventional methods. Since survival is often linked to the extent of spread at the time of diagnosis, catching it before it has the chance is optimal.

2) Perinatal Medicine

There are many exciting things happening in this field from successful fetal surgeries correcting congenital anomalies while still in the womb to the first baby born via uterus transplant in the United States (see [here](#)) [2].

However, it is the **Artificial Womb** [3] that takes the cake this year given its relative success compared to previous attempts. **One in 10 U.S. births** [4] are premature (younger than 37 weeks gestational age). Co-morbidities and mortality rates are high in the premature infant with extreme prematurity contributing to one-third of all infant deaths and one-half of all cases of cerebral palsy. With **roughly 30,000** [4] babies born annually who are less than 26 weeks old or critically premature, our current restricted ability to mimic the in utero environment plays a role in the many problems that arise.

In April, a multidisciplinary team published their findings in [Nature Communications](#) [3] of an extra-uterine system. They achieved success in preliminary animal studies physiologically maintaining the extremely premature lamb in this artificial womb for a month.

If this could ultimately translate to humans, each week of development for the infant within a natural or artificial womb could make a world of difference in survival and reduction of disabilities. Let's not forget the economic influence it might have on an **estimated \$43 billion** [4] in annual medical costs of prematurity in the U.S. Though there are ethical considerations; this device is not intended to replace gestation but rather to give the extremely premature infant the best chance for the healthiest life possible.

3) Digital Health

There is a lot of activity in this space, some great and some useless, even burdensome. New terms like "interoperability" are code for fixing the debacle that has been the electronic medical record. (I will believe it when I see it). Endless products offer data collection from vital signs to extraneous information, separating the wheat from the chaff is a big challenge in this realm.

Of particular note is the **digital pill** and its potential ramifications. To combat patient non-compliance with medications, the [FDA just approved the first pill](#) [5] with an ingestible tracking sensor.

The improper use of medication is a real problem, particularly in chronic disease. According to a [new study](#) [6] of unintentional therapeutic pharmaceutical errors, those causing profound impairment, disability, and death showed a 100% rate increase from 2000 to 2012. Many solutions attempting to make a dent in the issue are already in play, like containers that alarm if a person misses a dose. This new digital pill hopes to disrupt the market.

To appreciate the possible positive and negative scope of its influence, read [FDA Approves Pill With Tracking Sensor: Ingenious Or Big Brother?](#) [7]

4) It is **Game On!** at the U.S. Food and Drug Administration (FDA)

Great science and policy changes are happening under Commissioner Scott Gottlieb's FDA that is, so far, striking the right balance between ensuring patient safety and creating a climate that spurs innovation.

In a relatively short period time at the helm, here are just a few examples:

- A backlog of roughly 200 orphan drug designation requests that were pending review was eliminated ahead of schedule with strong language that it will never happen again.
- Recognizing the FDA lacks a direct role in drug pricing, its strategy is to facilitate intensifying market competition to drive down prices (by encouraging generic use) thereby increasing accessibility and innovation (see details of Drug Competition Action Plan [here](#) [8]). The parallel focus to achieve these goals is to curb abuses of the Orphan Drug Act (ODA), review [here](#) [9].
- With today's ease of direct-to-consumer (DTC) communication, product overstatements of health benefits with minimization of harms have become the norm (e.g. think at home genetic test kits, drug ads). Now the [U.S. Food and Drug Administration \(FDA\)](#) [10] wants to preserve the sanctity of the doctor-patient relationship by reducing the unfounded fears these conflicted messages bring so that patients do not delay seeking appropriate treatment or being compliant with medical care. See [here](#) [11].
- There is a profusion of developments in regenerative medicine, particularly in some suspect stem cell practices (see [here](#) [12]). Regulatory bodies need to walk a fine line between implementing some restrictions to curb bad actors while still fostering innovation so the legitimate work already in progress can stand on its own merits without being muddied by shady endeavors. In [Is The Wild West Of Stem Cell Therapies Coming To An End?](#) [13], I address [newly released guidelines](#) [14] suggest illegitimate, unproven uses might become a thing of the past.

Click [here](#) [15] for the remainder of the [Top 8 Med, Tech Advances of 2017. Plus, Prediction for Future.](#) [15]

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Links

- [1] <http://stm.sciencemag.org/content/9/399/eaaa0984>
- [2] <https://www.acsh.org/news/2017/12/04/baby-born-transplanted-uterus-first-time-us-12233>
- [3] <https://www.nature.com/articles/ncomms15112>
- [4] <http://www.chop.edu/news/unique-womb-device-could-reduce-mortality-and-disability-extremely-premature-babies>
- [5] <https://www.fda.gov/NewsEvents/Newsroom/PressAnnouncements/ucm584933.htm>
- [6] <http://www.tandfonline.com/doi/abs/10.1080/15563650.2017.1337908?needAccess=true&>
- [7] <https://www.acsh.org/news/2017/11/16/fda-approves-pill-tracking-sensor-ingenious-or-big-brother-12152>
- [8] <https://blogs.fda.gov/fdavoices/index.php/2017/06/fda-working-to-lift-barriers-to-generic-drug-competition/>
- [9] <https://www.acsh.org/news/2017/09/28/fda-closing-loopholes-game-orphan-drug-act-11885>
- [10] <https://www.federalregister.gov/documents/2017/08/21/2017-17563/content-of-risk-information-in-the-major-statement-in-prescription-drug-direct-to-consumer-broadcast?source=acsh.org>
- [11] <https://www.acsh.org/news/2017/08/25/fda-change-how-prescription-drugs-and-biologics-are-advertised-11744>
- [12] <https://www.acsh.org/news/2017/07/10/fraud-alert-unproven-stem-cell-use-prompts-international-call-action-11526>
- [13] <https://www.acsh.org/news/2017/11/17/wild-west-stem-cell-therapies-coming-end-12162>
- [14] <https://www.fda.gov/NewsEvents/Newsroom/PressAnnouncements/ucm585345.htm>
- [15] <https://www.acsh.org/news/2017/12/18/top-8-med-tech-advances-2017-plus-prediction-future-12298>