Are we there yet? How and when specific biotechnologies will improve human health

Patient X: A 67-year-old Caucasian man slips on a patch of ice. He has abrasions to his hands and has sustained significant damage to his hip. At the emergency room, he informs clinicians he takes atorvastatin, metformin and glimepiride to treat hypertension and Type 2 Diabetes Mellitus (T2DM). X-rays reveal a fractured hip, which will require total hip replacement surgery. Biotechnology is a major force poised to help us to live longer and healthier lives. In 2015, the United Nations defined 17 Sustainable Development Goals aimed at providing an all-encompassing framework for improving the state of the world (**). Promoting healthy living for all at all ages, is one of the principal objectives. Using the commonplace example described above, we examine how some of the most well-known biotechnologies (genome editing, stem cell therapy, tissue engineering and precision medicine) are able to benefit Patient X today, in 2018 and we also provide perspective on the additional value these same technologies could offer only ~20 years into the future (Fig. 1). During this ~20 year gap, both technical challenges as well as ethical, legal and socio-economic questions must be addressed before these technologies can achieve broader impact. Further, as both the successes and the failures will likely have enduring effects on society, responsible oversight of these and other biotechnologies are necessary as science and applications move out of the lab into clinical practice. In the next 20 years biotechnology will undoubtedly transform healthcare but how, when and, in some cases, whether it should, require careful consideration.

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