

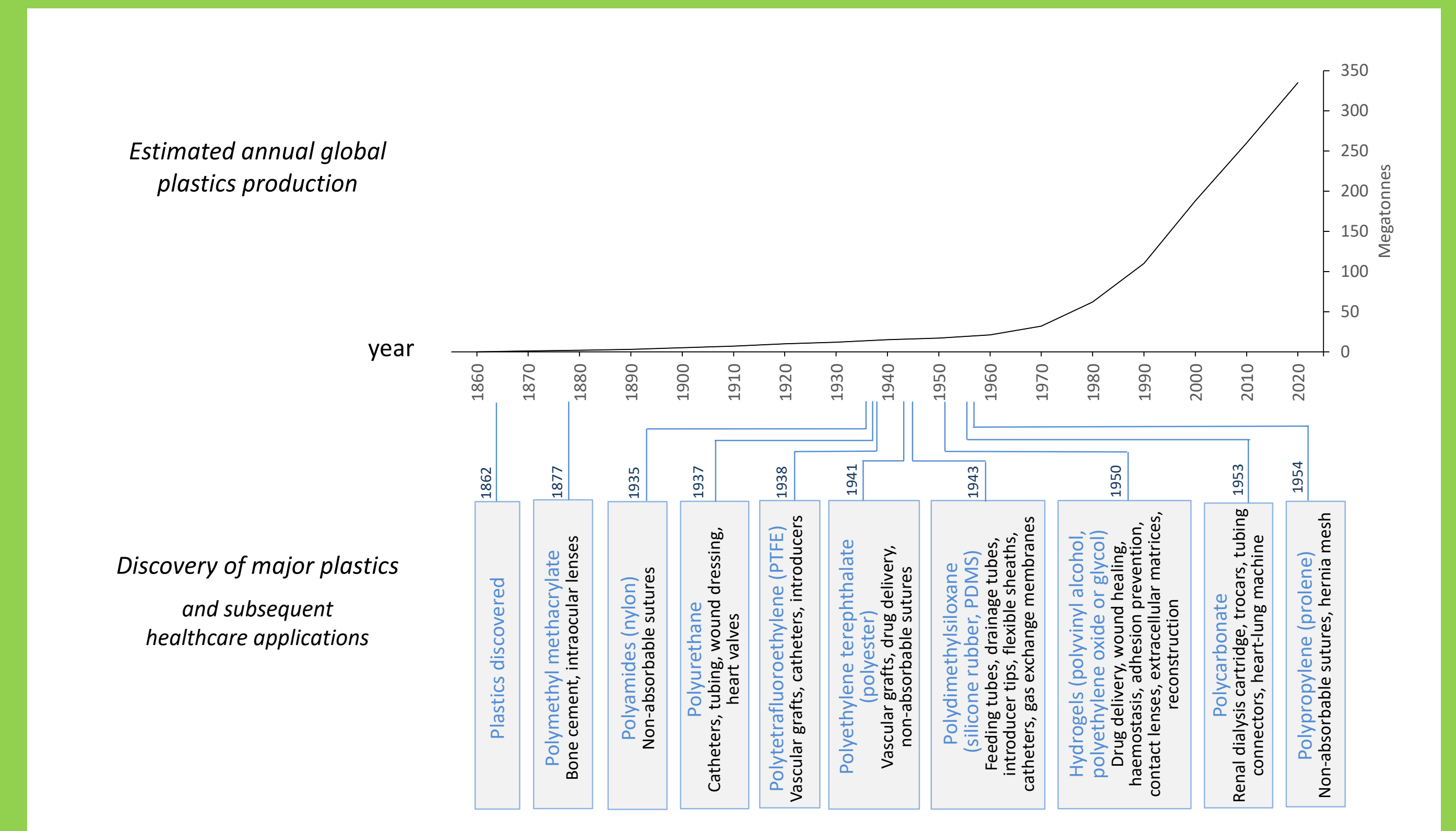
Background

The environmental harm caused by plastics is gaining worldwide attention. This has led to calls to reduce the use of plastics, alongside reuse and recycling. Healthcare is not excused from this agenda. The primary aim of this study is to determine the extent of the problem of plastic use in healthcare and to identify solutions (both existing and emerging).

Plastics in Healthcare

- The medical plastics market is 2% of global total plastics production (US\$20.5 billion), and is growing by 6.3% per year.(1) (Figure 1)
- 2/3 thirds of medical waste are from sharps, medical packaging, blood bags, tubing and cafeteria waste.(2)
- We calculate approximately 1.7 million tonnes of health related plastic waste are generated in the US alone each year.
- The vast majority of medical plastics end up in landfill and this approach is linear and unsustainable.
- <10% of all UK healthcare waste is recycled,(3) and rates are likely lower for plastic healthcare waste.(4)

Figure 1: Development of major plastics and their subsequent healthcare applications along with increase in annual global plastics production over time (adapted from (16))



Reduce

A number of studies demonstrate the potential to reduce unnecessary plastics in theatre settings,(5) renal dialysis(6) and unnecessary double wrapping of sterile equipment.(7) Novel solutions include use of biodegradable plastics engineered from corn or molasses feedstock for tissue engineering, orthopaedic devices and wound management.(8)

Figure 2: 101 single use pieces of plastic, generated by one typical adenotonsillectomy operation



Reuse

We found that a single typical adenotonsillectomy operation at our local teaching hospital generated 101 separate pieces of single-use plastic. Here we identify the opportunities to expand reuse of medical plastics:

- preferential use of reusable items where these are readily available (and supported by LCAs and financial analysis)(9)
- develop the evidence basis for infection risk of medical devices and appropriately classify these as reusable or single use
- apply pressure to manufacturers to optimise medical device design for reuse

Recycle

In instances where plastics cannot be substituted or reused, disposal needs to be improved. Studies indicate high potential recyclability of medical plastics (64% in theatre(10) and 8% of infectious anaesthetic waste(11)). Recycling facilities in hospitals are highly variable, yet good recycling systems are, in most circumstances, both environmentally and financially viable.(12-14) A novel waste management strategy is plasma pyrolysis, which can convert medical plastic waste into useful products (such as alternative fuels).(15)



FUTURE CHALLENGES

Healthcare professionals & organisations: look at improving awareness, using reusable items where possible, and supporting development and use of recycling or reprocessing facilities.

Healthcare manufacturing industry: (through either voluntary or legislative changes) can partner in easier reprocessing or recycling of their products, reduction or replacement of plastic packaging, and contribution to LCA analyses.

Academic community, and funding bodies: should look to answer key research questions, which may be context specific. These include the infection risk associated with reuse of medical devices; LCA assessments of reusable versus disposable devices, and approaches to recovery of materials or energy from plastic healthcare waste.

Conclusions

Potential, but largely unqualified, infection risk, or convenience, can no longer be used as reasons to exempt healthcare from the global imperative to reduce reliance on plastics. Indeed, we would argue that the harms from plastics to human and environmental health are so well-evidenced that discussions about alternatives should be urgently made integral to the provision of healthcare.

References (PMID unless stated)

1. <https://www.grandviewresearch.com/industry-analysis/medical-plastics-market>, 2.12092754, 3.19278971, 4. https://www.sduhealth.org.uk/resource/register.aspx?ResourceID=697_5, 5. 27153160
 6.