Saving Lives and Making Money: The Ethics Involved in Creating Breakthrough Medical Technologies

1 Executive Summary

Many new biomedical technologies promise to extend or improve the quality of human life. Both 3D printing of human tissue to create human hearts and using Artificial Intelligence (AI) to detect and diagnose diseases such as skin cancer, are relatively new technologies that are making significant progress toward both of these aims.

Modern society has been shaped by rapid and ingenious development of 3D printing technology in countless fields, with the use of 3D modelling and printing for medical purposes revolutionizing surgical and clinical practices. The engineering and printing of complex cardiovascular systems through this technology has significantly advanced the healthcare industry in many ways. However, while there are significant numbers of patients who would benefit from 3D printed hearts, many of the decisions around this technology are being made on the basis of making profits or reducing costs rather than improving patient care.

The use of Artificial Intelligence (AI) within the health services sector continues to expand rapidly. Currently, AI driven diagnosis matches the ability of humans when diagnosing diseases, as AI recognizes patterns in behavior and creates its own logic for diagnosis over time. Again, profit making and cost cutting is enabled by this technology in parallel with its ability to improve and extend human life through earlier diagnosis. For legal reasons, AI diagnosis is problematic as assigning liability for misdiagnosis is extremely difficult.

3D printing for human hearts and AI diagnosis can save lives and greatly improve health outcomes while reducing costs, however, both of these technologies involve significant ethical risks in their use and implementation. These technologies can be misused, potentially eliminate a large number of jobs and significantly change the way that health services are provided. Profit-driven business cases appear to dominate the development of these fields to the potential detriment of design, ethics and public health.

We found that both engineers and medical doctors, while critical to the manufacture of these technologies, are under-represented on the governance boards of organizations. In our research only 18% of board members were engineers and 8% were medical doctors. The board level is where critical ethical decisions are made regarding the use of these technologies and engineers need to be represented at this level.

We found that engineering education is lagging behind technology and that educational approaches need to be changed if engineering students in these sectors are to be adequately prepared for the work place. We also found that current ethical engineering education for engineers does not address the myriad of issues found within the healthcare sector. Engineers are not being given the tools and support they need to make the best possible ethical decisions in this space. Engineers also need to be better educated as to the impact of government policy and private investment on engineering research and practice within biosystems.

The report outlines why engineering education needs to change significantly and rapidly if engineers are to be adequately trained in these healthcare technologies and the ethical decisions that they involve. We also recommend that the professional engineering community needs to ensure that engineers have a greater say at the board level and in government policy if engineers are to influence the evolution of these technologies and how they impact the public.

Our recommendations focus on three areas.

- Engineering education involving biosystems concepts needs to begin in middle and high schools, if not earlier.
- Ethics education needs to be increased within University engineering programs and expanded to address the impact of government policy and private investment on practice and research in bioystems.
- The engineering profession needs to actively work to promote the position that all good governance boards should have engineer as a board member to ensure that ethical decisions made at the highest level include an engineering perspective.

While these recommendations do not address all the ethical considerations that engineers who work in the biosystems sector must face, we believe they represent a good start.

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