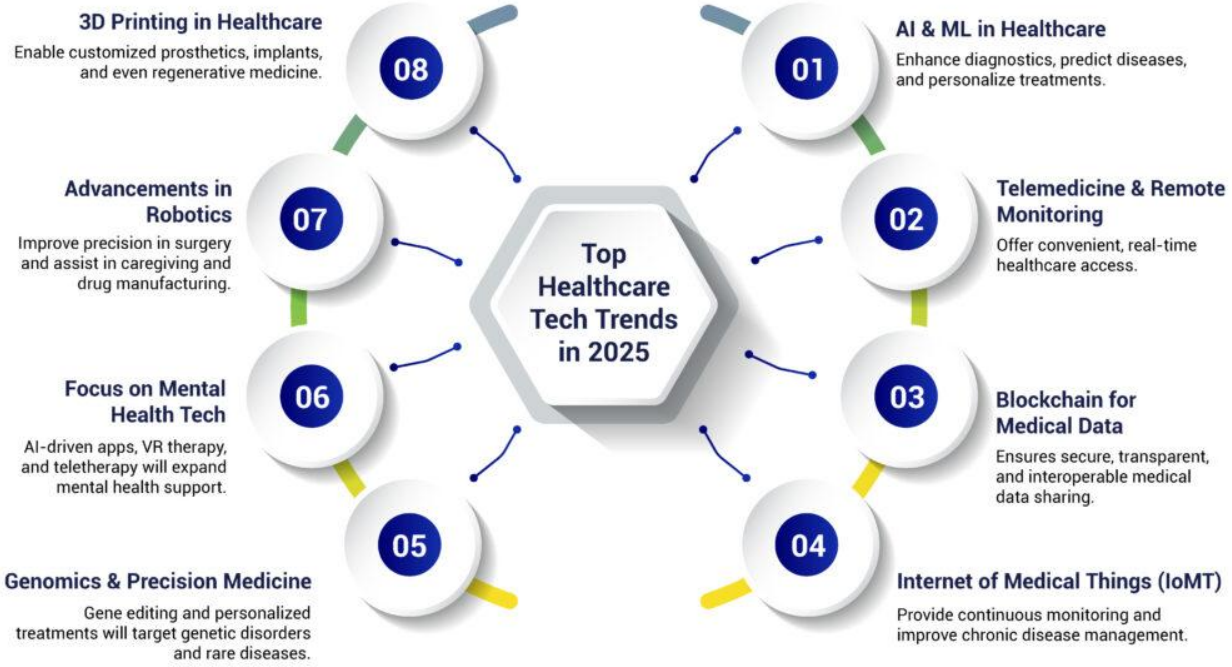
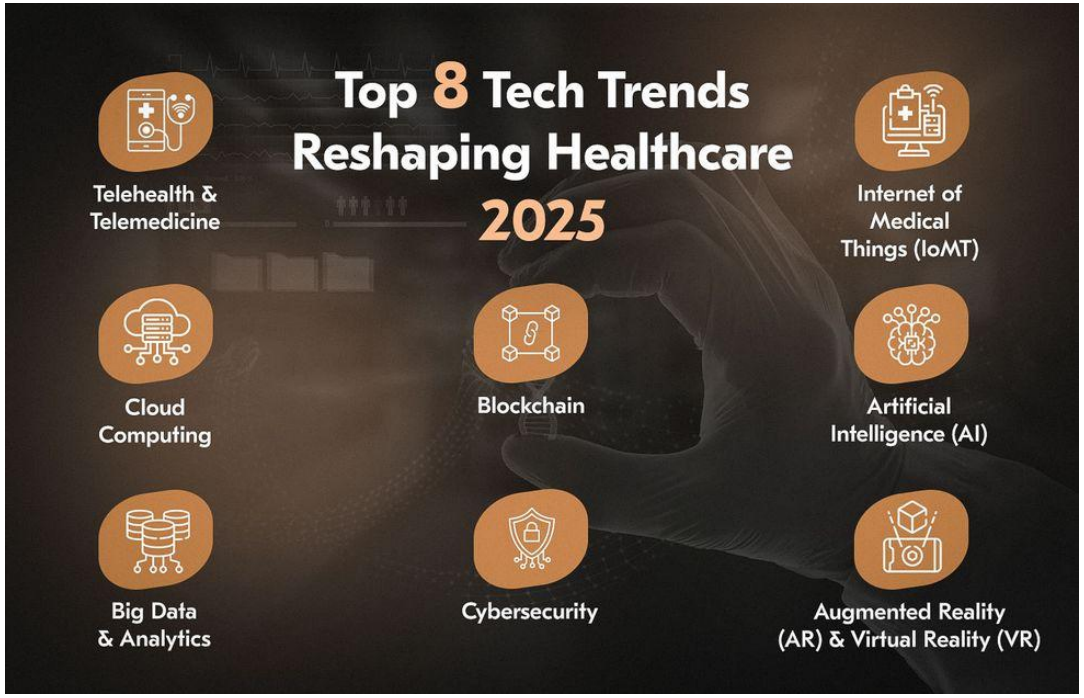
Health innovation and technology in the changing World

รศ.ดร.นพ. จิรุตม์ ศรีรัตนบัลล์

ภาควิชาเวชศาสตร์ป้องกันและสังคม

รองคณบดีฝ่ายวางแผนและพัฒนา คณะแพทยศาสตร์ จุฬาลงกรณ์มหาวิทยาลัย





15+ Emerging Healthcare Technology Trends for 2025 and the Future

Source: https://www.bitcot.com/healthcare-technology-trends/

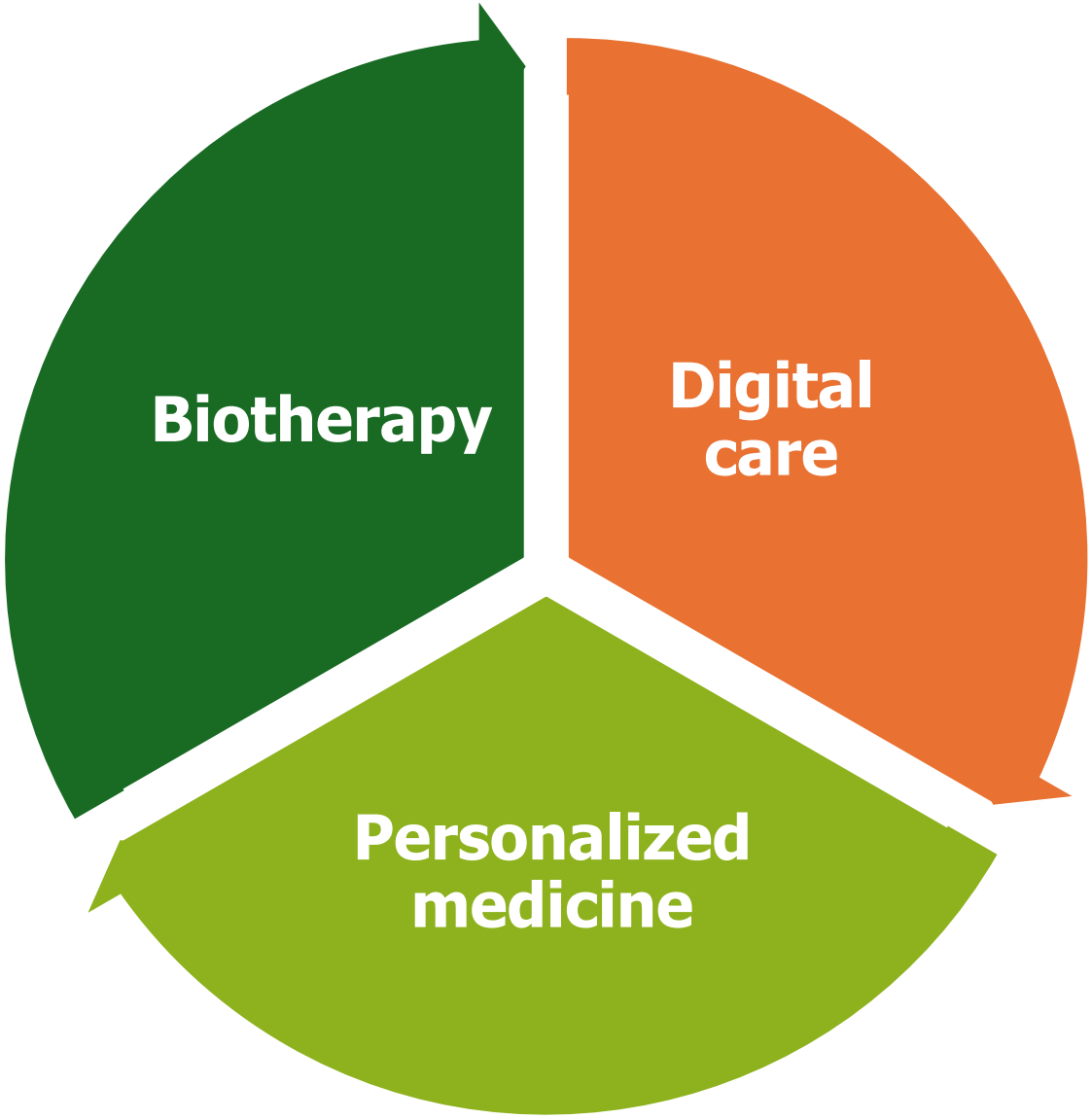
2024 HEALTHCARE TECHNOLOGY TRENDS HEATMAP

Created by the HIMSS Nursing Innovation Advisory Workgroup

Solution	Ease of Implementation	Schedule Feasibility	Threat	Economic Feasibilty (Cost)	Operational Feasibility	Benefits (Functional, Emotional/Social)	Technical Feasibility	Total Score
Predictive model	3	3	2	1	4	1	3	21
Mobile Application Management	2	2	2	3	3	1	4	21
Falls Surveillance	3	2	2	3	4	1	4	22
Staffing Workload Predictions	4	2	3	3	3	1	3	22
Smart whiteboards in patient rooms	3	3	2	3	3	2	3	23
Remote monitoring	4	3	3	3	3	1	3	23
GenAI use in EHR	4	3	4	3	4	1	3	24
Staff Scheduling	4	2	3	4	4	1	3	25
Virtual Nursing	3	3	3	3	3	3	3	25
Alert / Alarm Communication Management	4	4	4	4	3	2	3	26

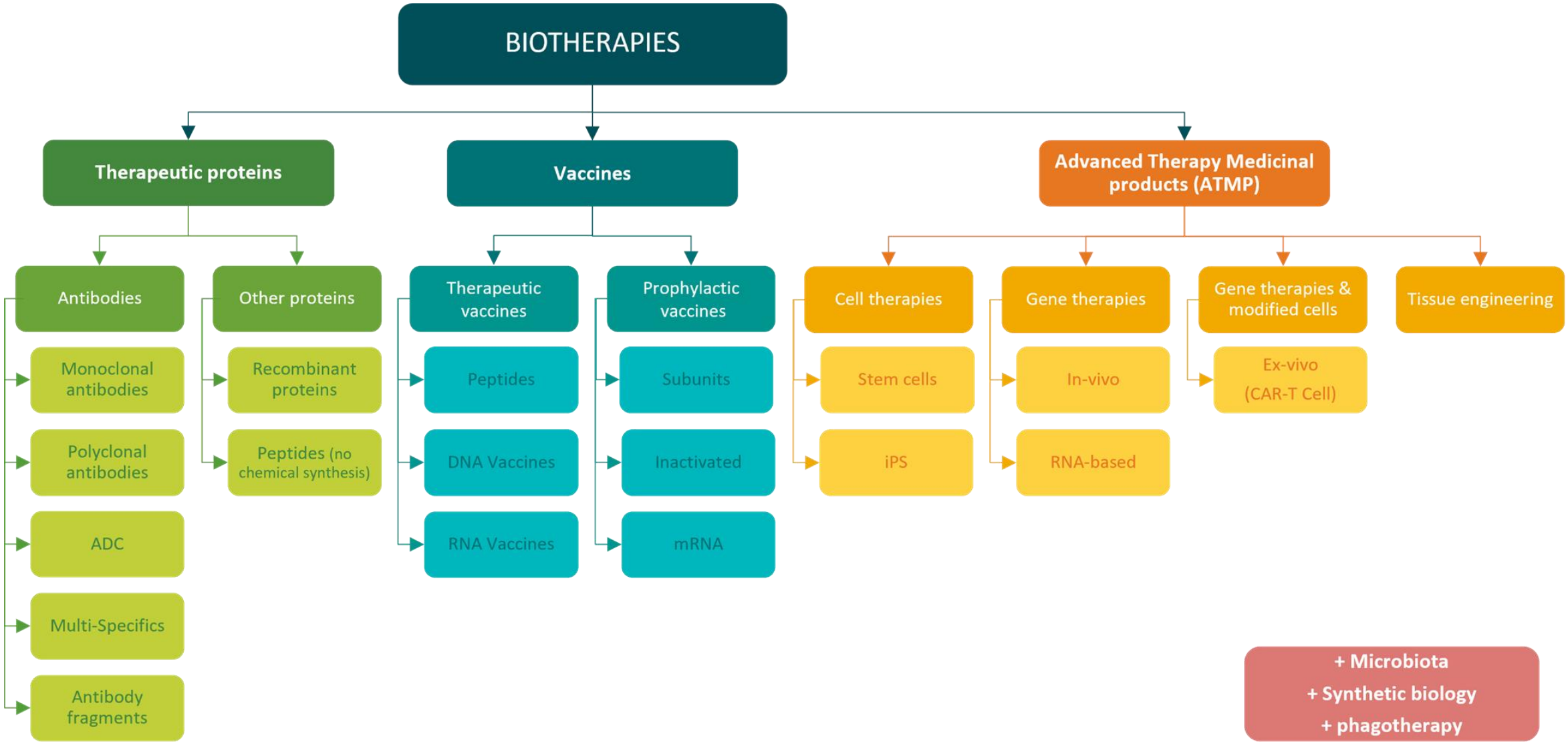
Scoring Criteria	1 - Very Easy	2 - Somewhat Easy	3 - Moderate	4 - Difficult	5 - Very Difficult
*Scoring Criteria for Benefits Assessment Only	Very High	Somewhat High	Neutral	Somewhat Low	Very Low

Health innovation and technology



1

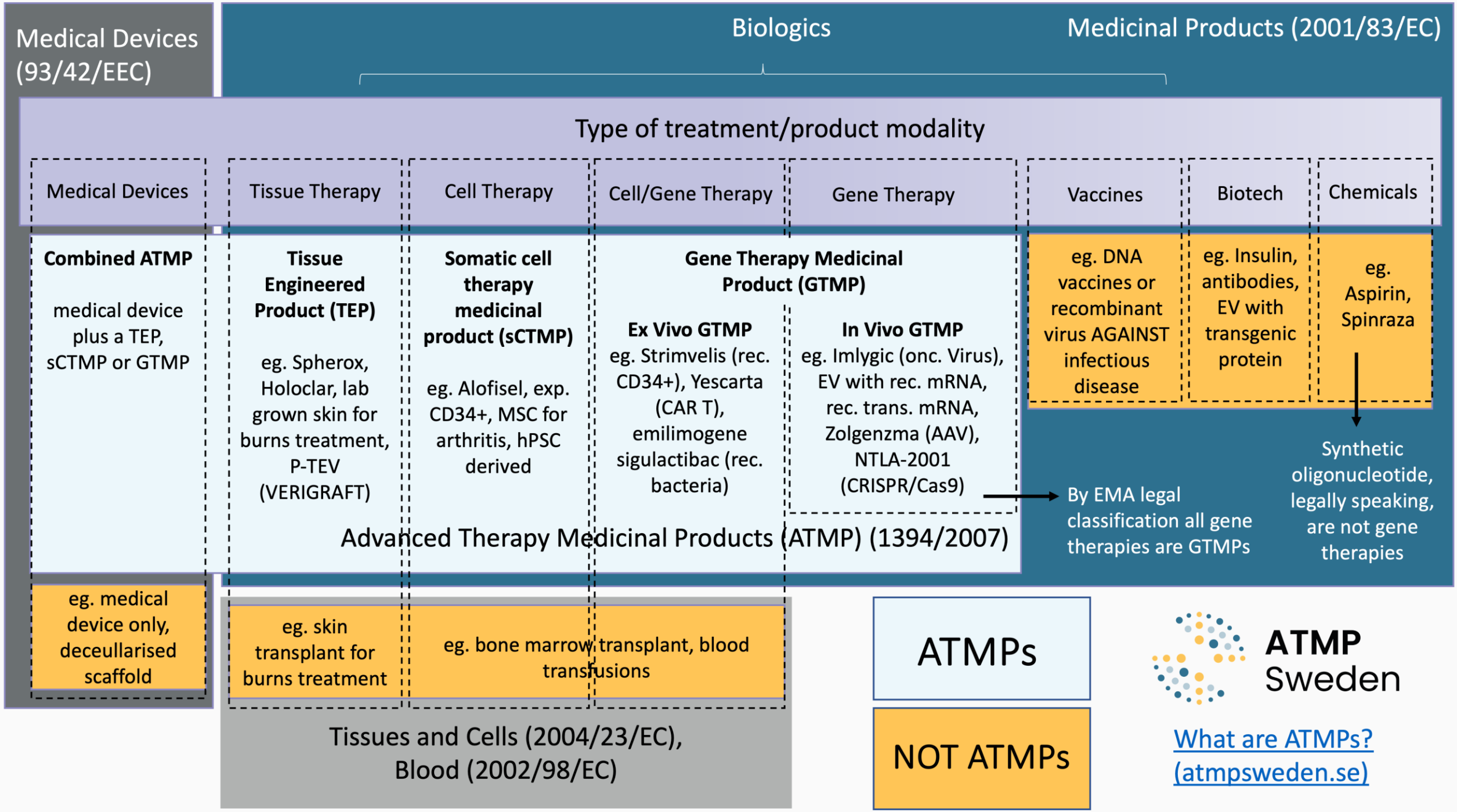
เทคโนโลยียาชีวบำบัด (Biotherapy)



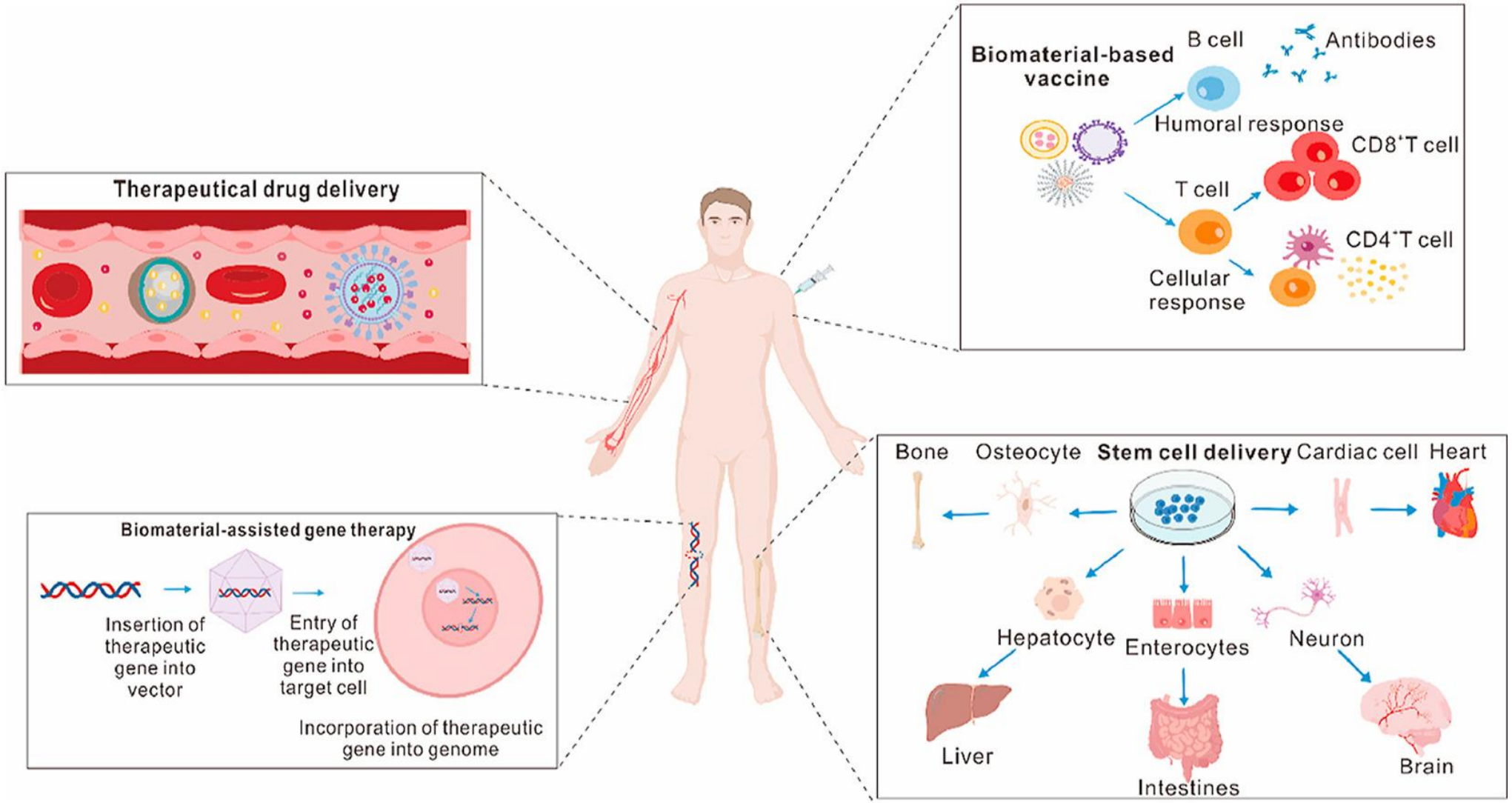
ATMPs

ย่อมาจาก **Advanced Therapy Medicinal Products** ซึ่งถือเป็นผลิตภัณฑ์ยาขั้นสูง

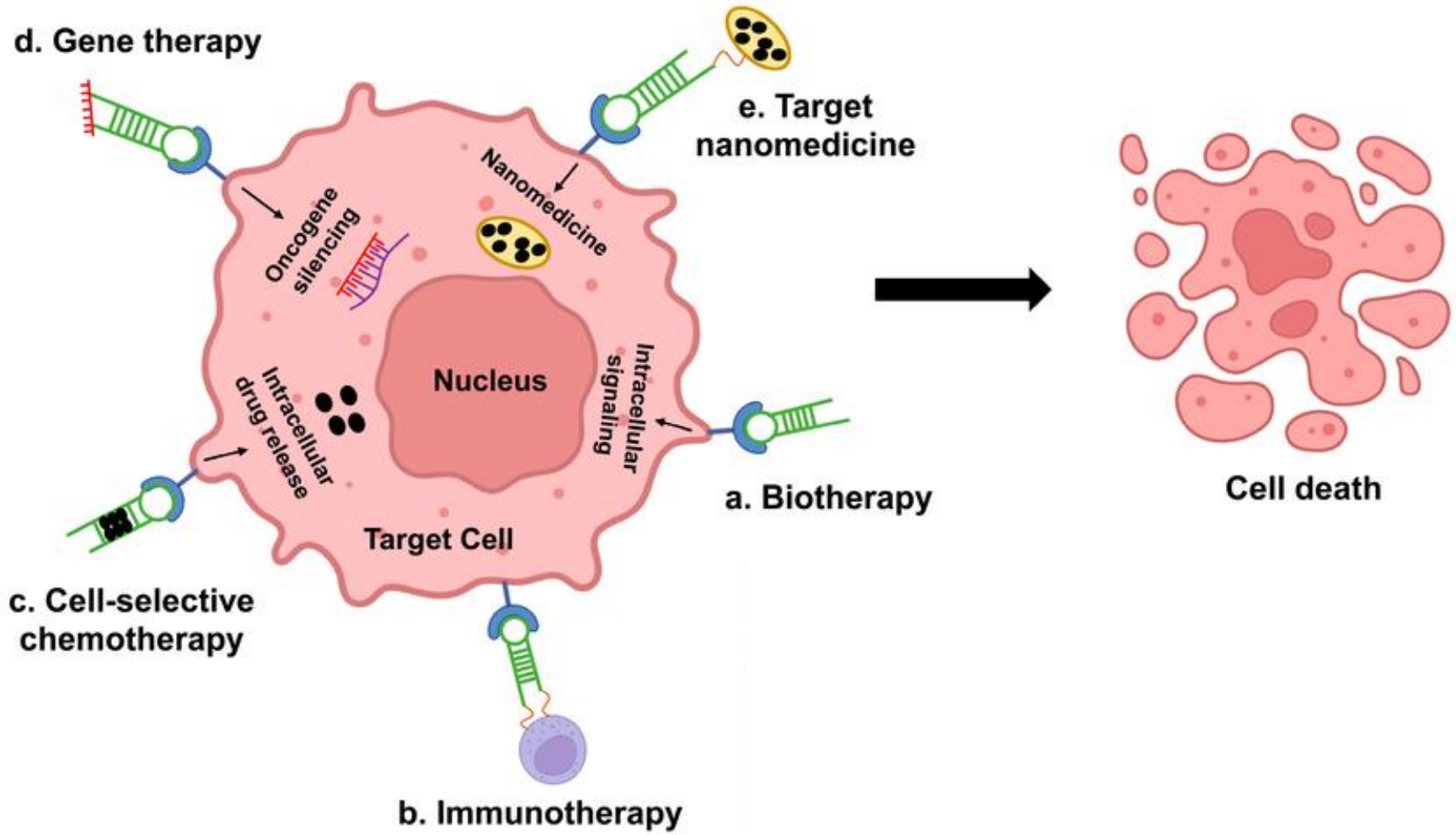
- **ยีนบำบัด (Gene Therapy)**: เป็นการรักษาโดยการใส่ยีนเข้าไปในเซลล์ของผู้ป่วยเพื่อแก้ไขความผิดปกติทางพันธุกรรม หรือเพื่อกระตุ้นให้เซลล์สร้างโปรตีนที่ร่างกายขาดไป
- **เซลล์บำบัด (Cell Therapy)**: เป็นการรักษาโดยการใช้เซลล์ที่มีชีวิต เช่น เซลล์ต้นกำเนิด หรือเซลล์ภูมิคุ้มกันมาฉีดหรือปลูกถ่ายเข้าสู่ร่างกายผู้ป่วย เพื่อซ่อมแซมเนื้อเยื่อที่เสียหาย หรือกระตุ้นระบบภูมิคุ้มกัน
- **วิศวกรรมเนื้อเยื่อ (Tissue-Engineered Products)**: เป็นการรักษาโดยการสร้างเนื้อเยื่อหรืออวัยวะขึ้นใหม่ในห้องปฏิบัติการ เพื่อนำไปปลูกถ่ายให้กับผู้ป่วย
- Combined ATMPs


Medical Devices (93/42/EEC)
Biologics
Medicinal Products (2001/83/EC)
Type of treatment/product modality
Medical Devices
Tissue Therapy
Cell Therapy
Cell/Gene Therapy
Gene Therapy
Vaccines
Biotech
Chemicals
Combined ATMP
medical device plus a TEP, sCTMP or GTMP
Tissue Engineered Product (TEP)
eg. Spherox, Holoclar, lab grown skin for burns treatment, P-TEV (VERIGRAFT)
Somatic cell therapy medicinal product (sCTMP)
eg. Alofisel, exp. CD34+, MSC for arthritis, hPSC derived
Gene Therapy Medicinal Product (GTMP)
Ex Vivo GTMP
eg. Strimvelis (rec. CD34+), Yescarta (CAR T), emilimogene sigulactibac (rec. bacteria)
In Vivo GTMP
eg. Imlygic (onc. Virus), EV with rec. mRNA, rec. trans. mRNA, Zolgenzma (AAV), NTLA-2001 (CRISPR/Cas9)
eg. DNA vaccines or recombinant virus AGAINST infectious disease
eg. Insulin, antibodies, EV with transgenic protein
eg. Aspirin, Spinraza
Synthetic oligonucleotide, legally speaking, are not gene therapies
By EMA legal classification all gene therapies are GTMPs
Advanced Therapy Medicinal Products (ATMP) (1394/2007)
eg. medical device only, deceullarised scaffold
eg. skin transplant for burns treatment
eg. bone marrow transplant, blood transfusions
Tissues and Cells (2004/23/EC), Blood (2002/98/EC)
ATMPs
NOT ATMPs
ATMP Sweden
What are ATMPs? (atmpsweden.se)

Biomaterials in biotherapy, including drug delivery, vaccine development, gene therapy, and stem cell therapy



การรักษามะเร็งในอนาคต นอกเหนือจากการผ่าตัด ฉายแสง และเคมีบำบัด



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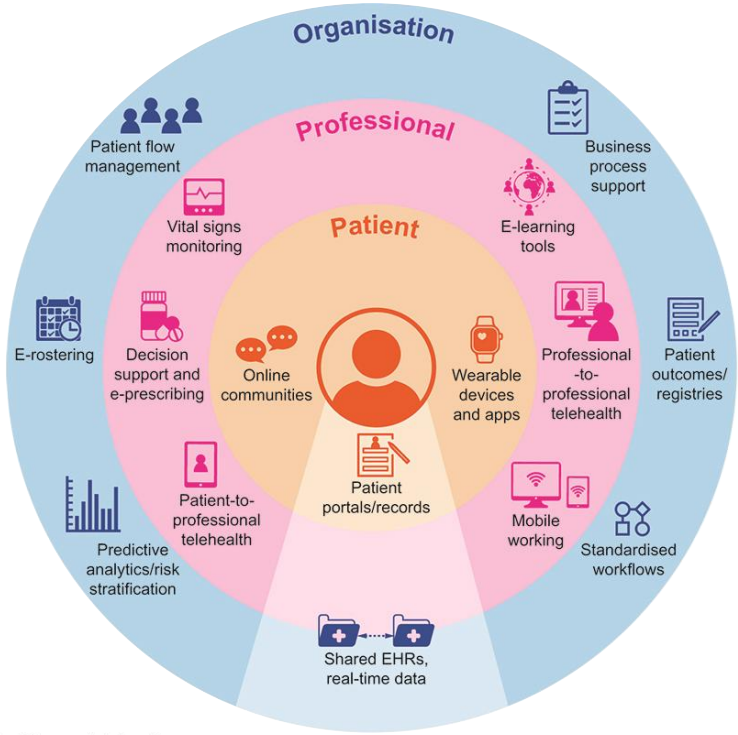
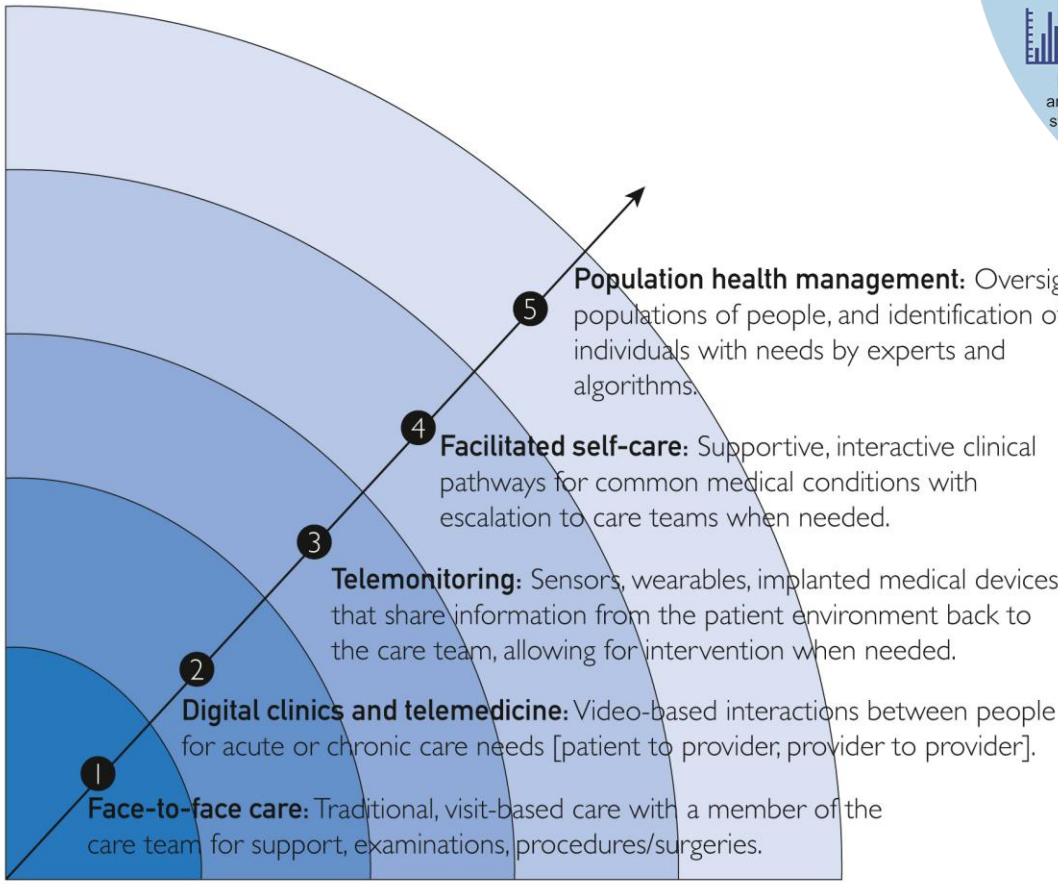
Digital care



Omnichannel digital experience example: Centrally sensitized chronic pain

1. **Face-to-face care:** Multi specialty clinics to assess, diagnose, and treat patients enabled by electronic pre visit questionnaires, nurse led virtual visits, and intelligent, digital scheduling.
2. **Digital clinics and telemedicine:** Video appointments and second opinions, as well as virtual only nurse and coach led multi session programs.
3. **Telemonitoring:** Passive activity and movement monitiring to support physical therapy and exerise goals, viewable by both patients and members of the care team.
3. **Facilitated self-care:** App based care guidance supporting mental, emotional, and physical health through mini education lessons, concept and activity reinforcement, and peer support, with activation capability back to care teams.
5. **Population health management:** Digitalized awareness, screening, and evidence based education support available at scale, linked to access to expert level care.



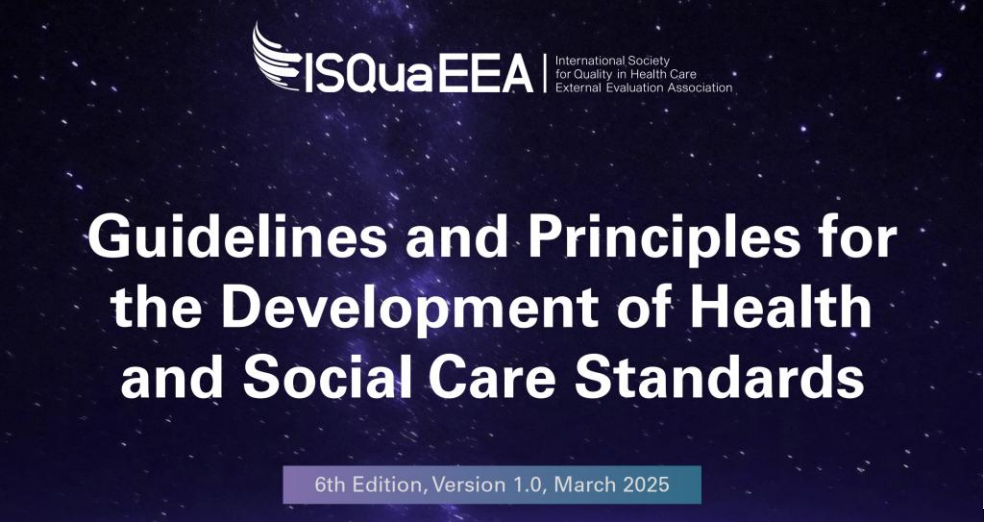
5 **Population health management:** Oversight of populations of people, and identification of individuals with needs by experts and algorithms.

4 **Facilitated self-care:** Supportive, interactive clinical pathways for common medical conditions with escalation to care teams when needed.

3 **Telemonitoring:** Sensors, wearables, implanted medical devices that share information from the patient environment back to the care team, allowing for intervention when needed.

2 **Digital clinics and telemedicine:** Video-based interactions between people for acute or chronic care needs [patient to provider, provider to provider].

1 **Face-to-face care:** Traditional, visit-based care with a member of the care team for support, examinations, procedures/surgeries.



2.1.3 | Major revisions and new content

The 6th Edition has been extensively revised from the 5th Edition, including 3 new areas of content in Principles 6 – 8:

Principle 6: Sustainable Care

Principle 7: Digital Care and Artificial Intelligence Systems for Care

Principle 8: Supporting the Care Workforce

The term **'digital care'** is used in the Principles to cover a range of care delivery approaches which include, but are not limited to, remote monitoring of patients/service users, smart-phone apps, wearable devices, virtual consultations which may be by telephone or online meeting platforms, remote reporting of test results, such as scans and X-rays. Other digital health approaches that are coming online should also be included.

7.1	**Criterion:** The standards require organisations to have a documented process for the assessment, costing, implementation and ongoing management of digital care systems.
	Guidance: The intention of the criterion is that standards encourage organisations to systematically carry out: • a cost/benefit analysis before implementing digital care • risk management of the degree of inter-operability between digital care systems and mitigation of risks where systems do not 'talk to each other' (that is, they are not inter-operable) • consideration of any potential unintended consequences from the introduction of digital care systems.

7.3	**Criterion:** The standards require organisations to have access to technical expertise to support the effective use of digital care systems.
	Guidance: The term 'access to technical expertise' includes, for example, from the vendors of the systems, an in-house technical team, or other contractual arrangements for technical support. The technical expertise provided could include the necessary testing and quality checks before any system is fully implemented.

7.4	**Criterion:** The standards require organisations to introduce and manage AI systems in accordance with any national or regional legislation or regulations on the use of AI, where these exist, or in their absence, based on available guidance for best practice.
	Guidance: To support the implementation and use of AI in health and care services, several organisations have developed guidance and best practice advice, these include: The World Health Organization (WHO) which has produced guidance on ethics and governance for the use of different types of AI systems: https://www.who.int/publications/i/item/9789240084759 The US Food and Drug Administration (FDA) has produced guidance on Artificial Intelligence and Machine Learning Software as a Medical Device: https://www.fda.gov/medical-devices/software-medical-device-samd/artificial-intelligence-and-machine-learning-software-medical-device The English National Health Service (NHS) has produced guidance on adopting AI systems in healthcare: https://www.digitalregulations.innovation.nhs.uk/regulations-and-guidance-for-adopters/

Applications Of Artificial Intelligence In Medicine

01
Disease diagnosis
Accurate illness identification through symptom analysis and data.

02
Drug discovery
Speeds research, predicts properties, finds potential treatments.

03
Medical imaging analysis
Improves diagnostics, detects anomalies in scans effectively.

04
Personalized treatment plans
Tailors therapies, utilizes patient data, genetic information.

05
Virtual health assistants
Provides care, schedules, offers medical guidance remotely.

06
Remote monitoring systems
Tracks health data, alerts changes, enhances remote care.

07
Precision surgery
Guides surgeons, boosts accuracy, minimizes invasiveness,.

08
Health informatics
Manages records, analyzes data, enhances healthcare delivery.

09
Predictive analytics
Forecasts outcomes, identifies risks, optimizes care plans effectively.

10
Medical research
Speeds discoveries, analyzes data, informs treatments efficiently.

Diagnostic safety – examples

- Early detection of sepsis.
- Facilitate reading of diagnostic images. — Main advantage is speed. Presently, performance of AI is not consistently equivalent or superior to radiologists.
- Rare diseases (often diagnosed with delay of more than five years).
- Protect against loss of information along chains and between silos.
- Health status monitoring and alerting (wearables!).

Physician's assistent

- Summarize notes in patient records.
- Create notes from conversations.
- Prepare drafts for responses to requests from patients.
- Curated Q&A for patients and professionals.

Finding the right care

- **Evidence-based care**: Find relevant randomized trial
- **Personalized care:** Suggest individualized care in complex cases based on a large corpus of clinical experience

Optimizing the care pathway

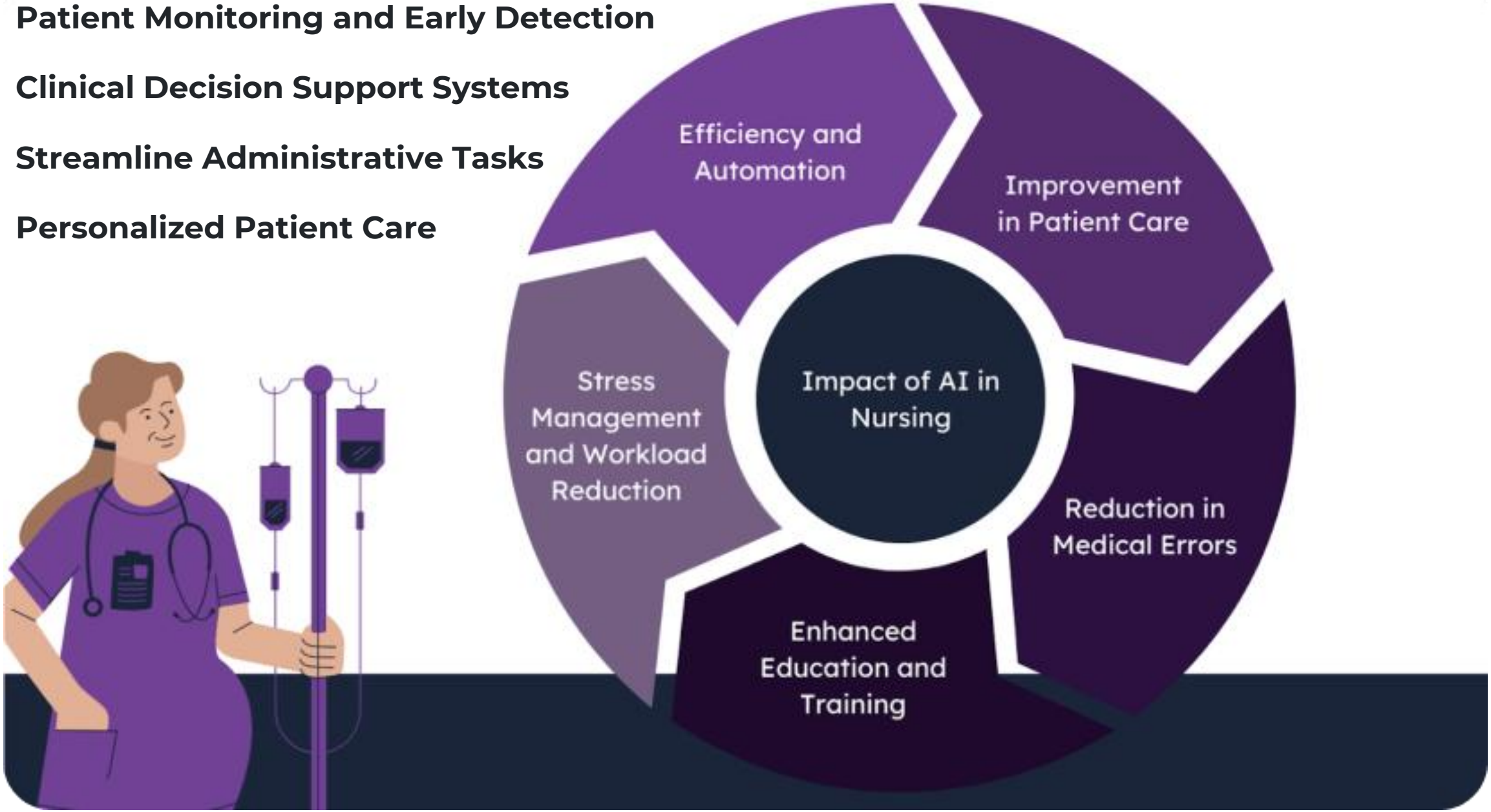
- Planning and flow optimization.
- Healthily: An example of an app to guide patients' journey (seek the right appointments) – reduce waste.

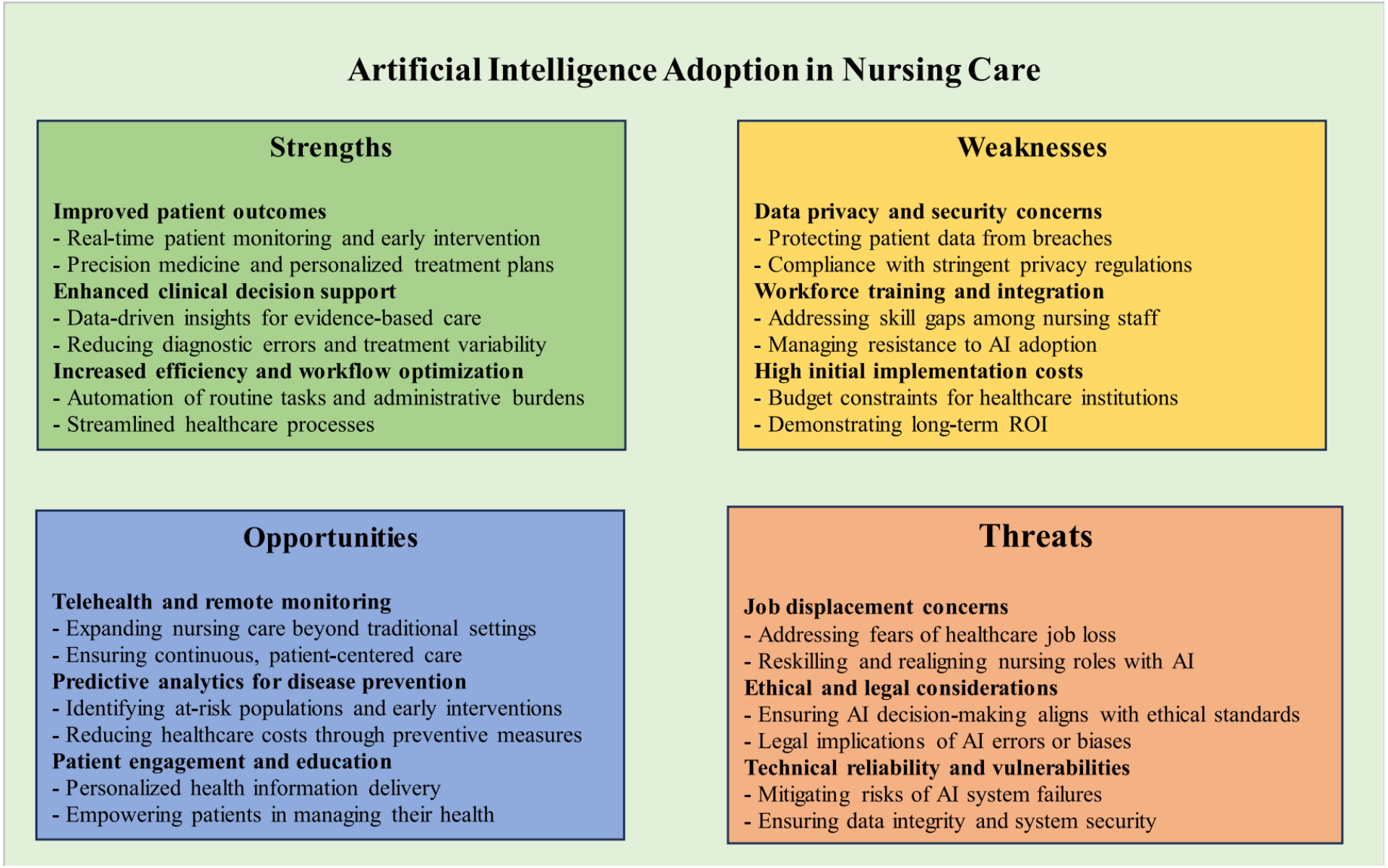
Patient Monitoring and Early Detection

Clinical Decision Support Systems

Streamline Administrative Tasks

Personalized Patient Care





Strengths, weaknesses, opportunities and threats (SWOT) analysis of artificial intelligence adoption in nursing care

Moustaq Karim Khan Rony [a,*,1], Khadiza Akter [b], Mitun Debnath [c], Md Moshiur Rahman [d], Fateha tuj Johra [e], Fazila Akter [f,m], Dipak Chandra Das [g], Sujit Mondal [h], Mousumi Das [i], Muhammad Join Uddin [j], Mst Rina Parvin [k,l]

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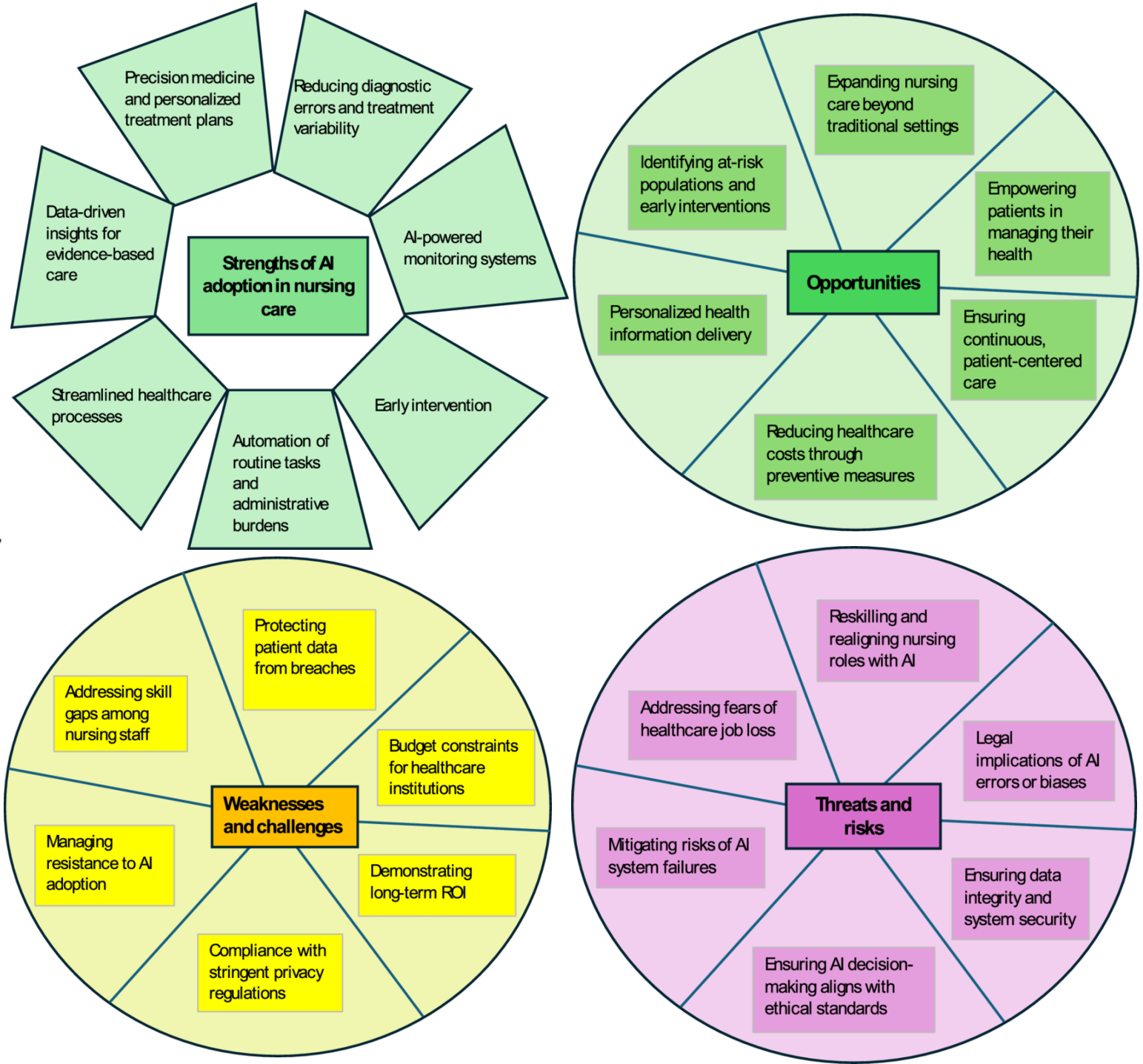
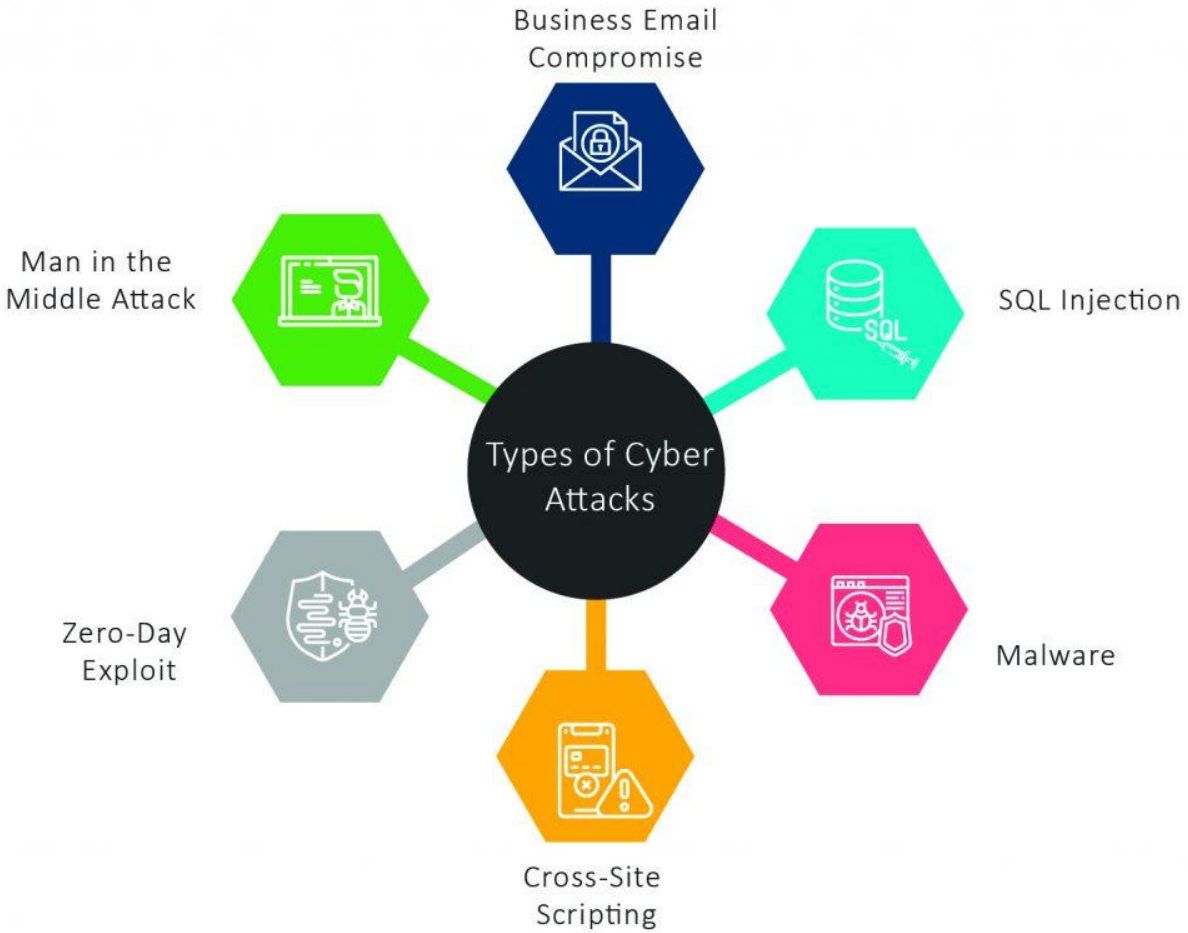
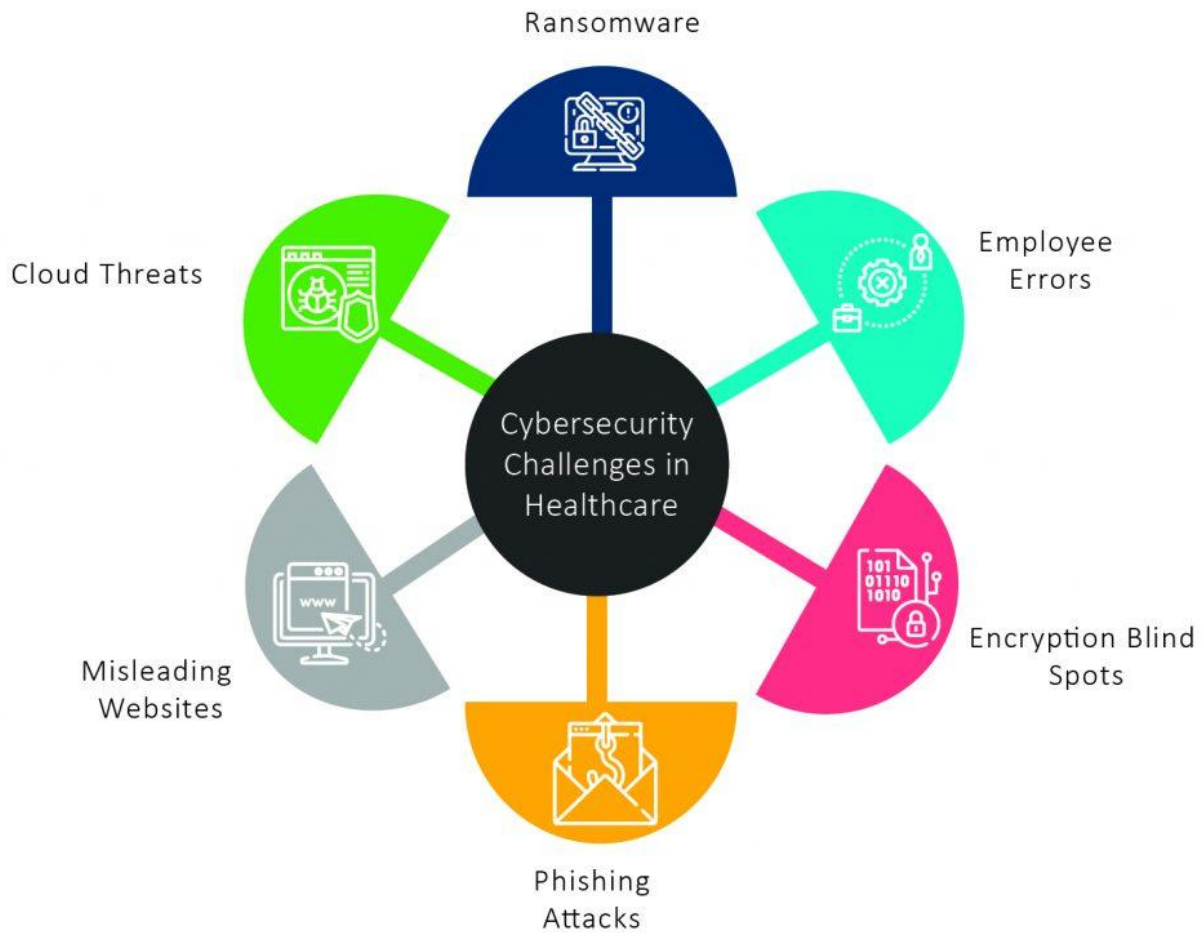


Cybersecurity





3

Precision medicine → Personalized medicine

Precision medicine: what is it?

The goal of precision medicine is to target the right treatment(s) to the right patient at the right time, by taking into account differences in their individual disease, general health, genes, environment, and lifestyle.

Current Medicine

One Treatment Fits All

Cancer patients with eg. colon cancer

Therapy

Future Medicine

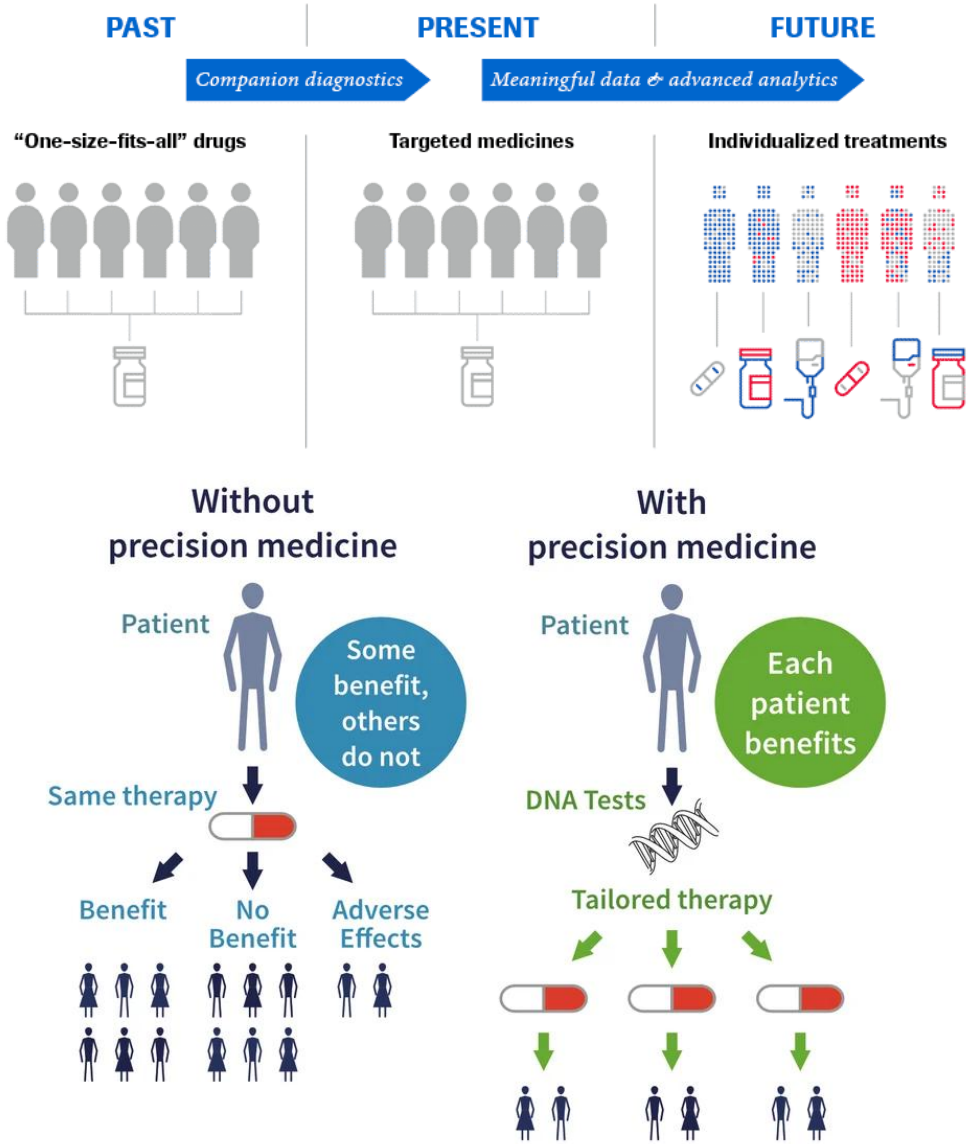
More Personalised Diagnostics

Cancer patients with eg. colon cancer

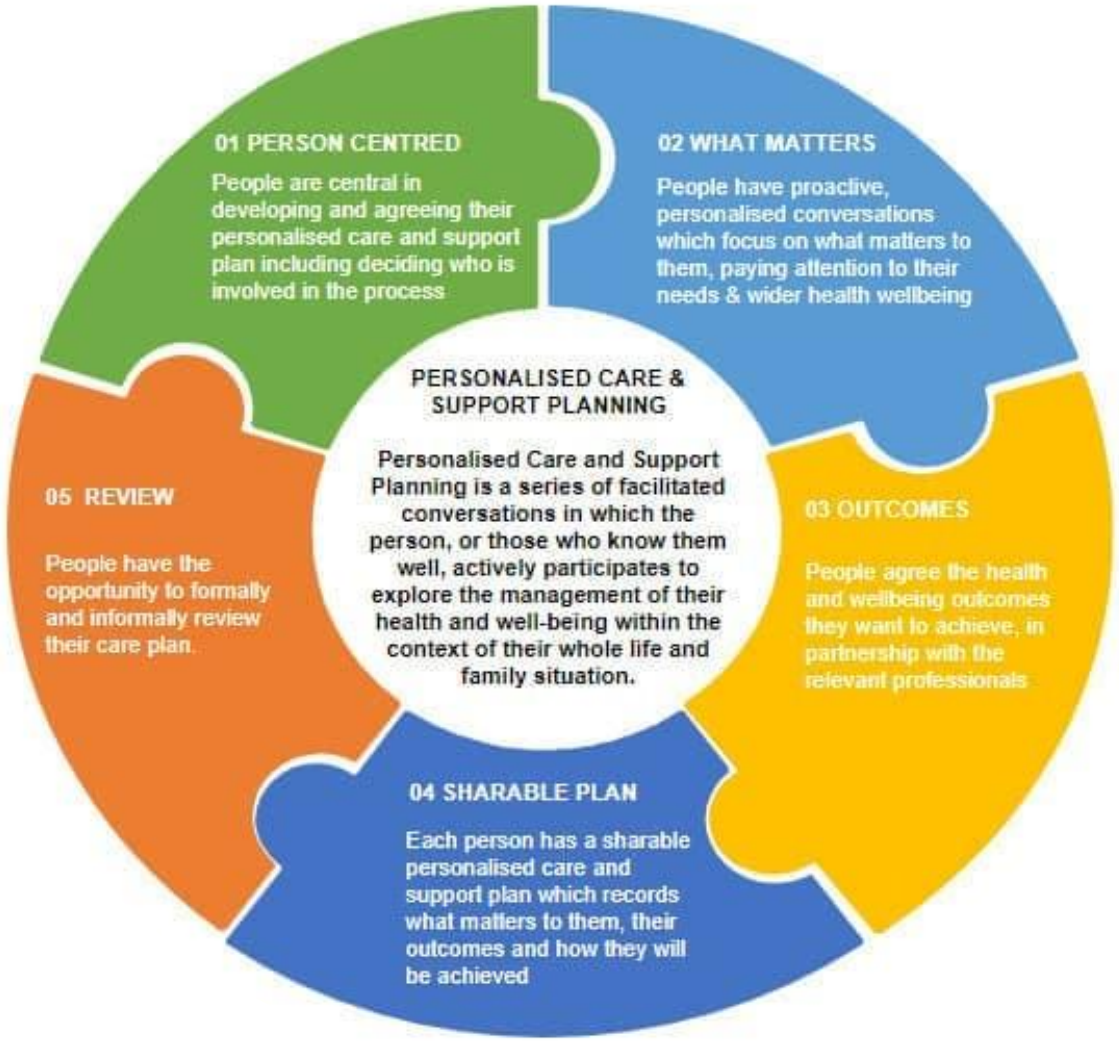
Blood, DNA, Urine and Tissue Analysis

Therapy tailored to different cancer profiles

Personalized health management and treatment

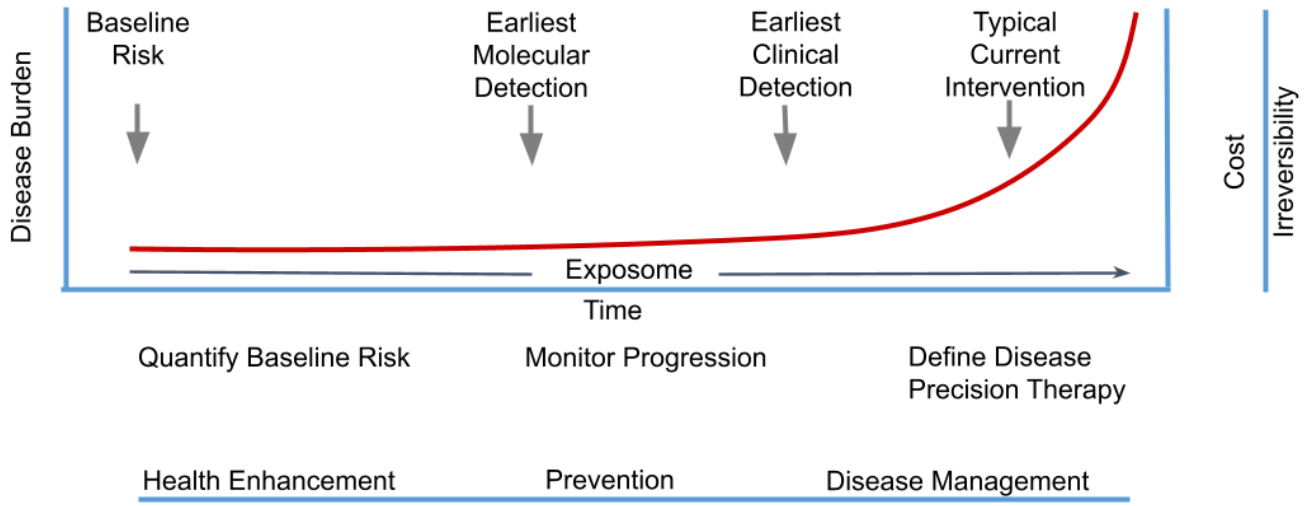


Personalized care

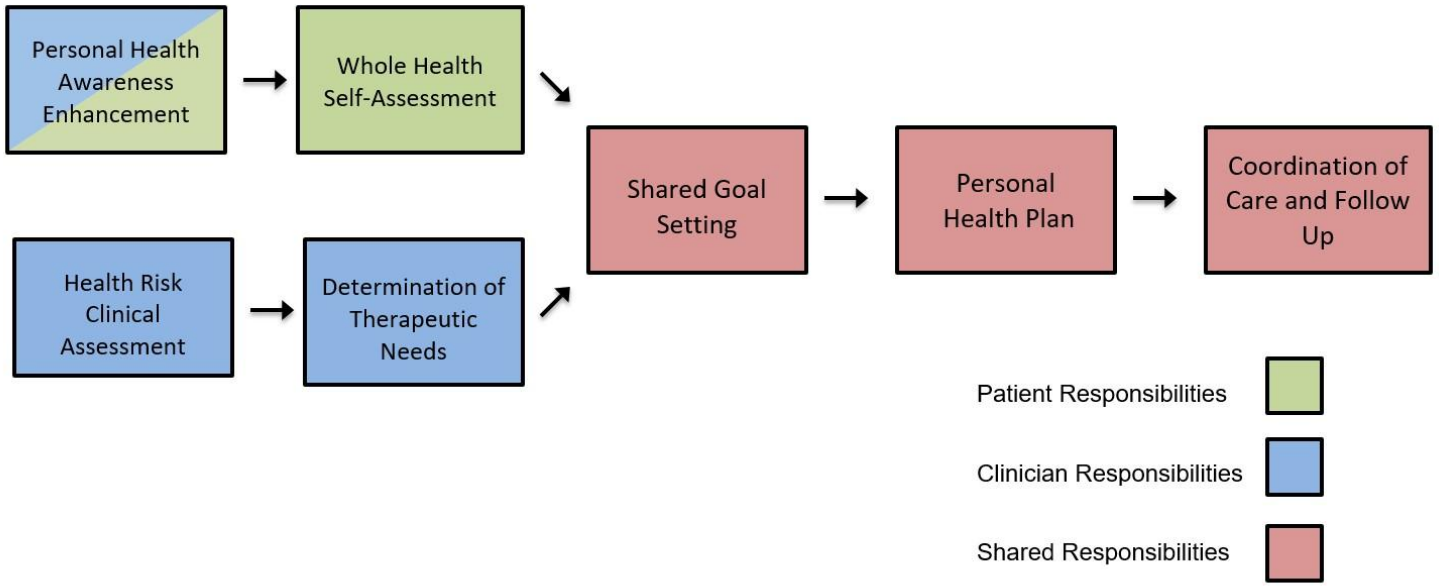


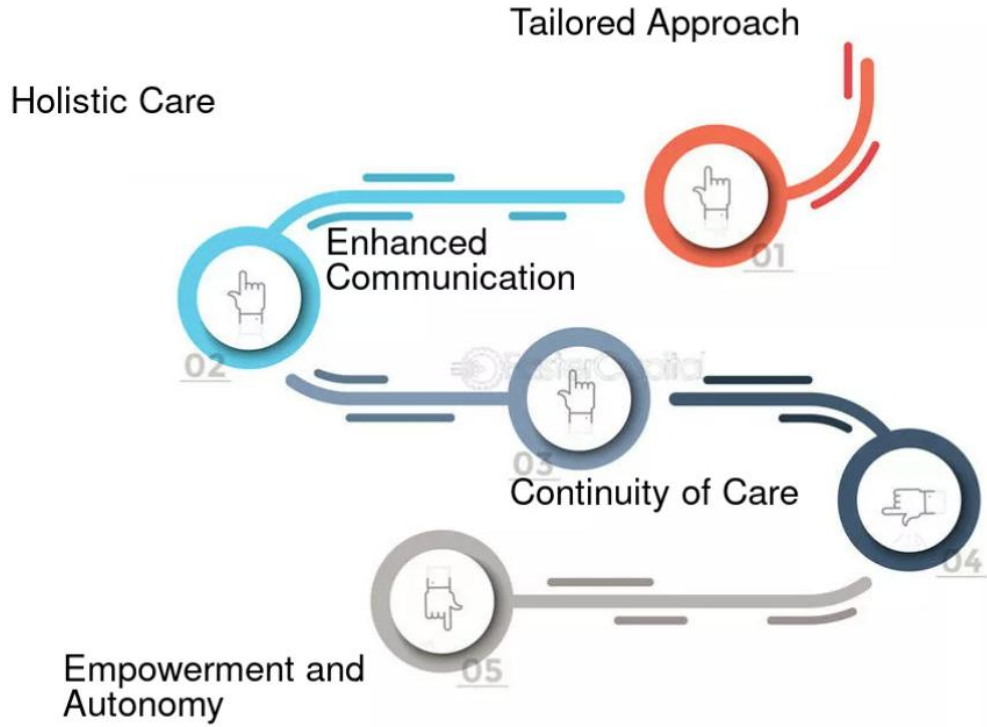
Source: www.happyhealthylives.uk/integrated-care-board/resources-and-services/personalising-care-for-our-people/what-is-personalised-care-the-comprehensive-model-and-the-six-components/

Inflection Curve of Disease Development



Primary Care Personalized Health Planning Model





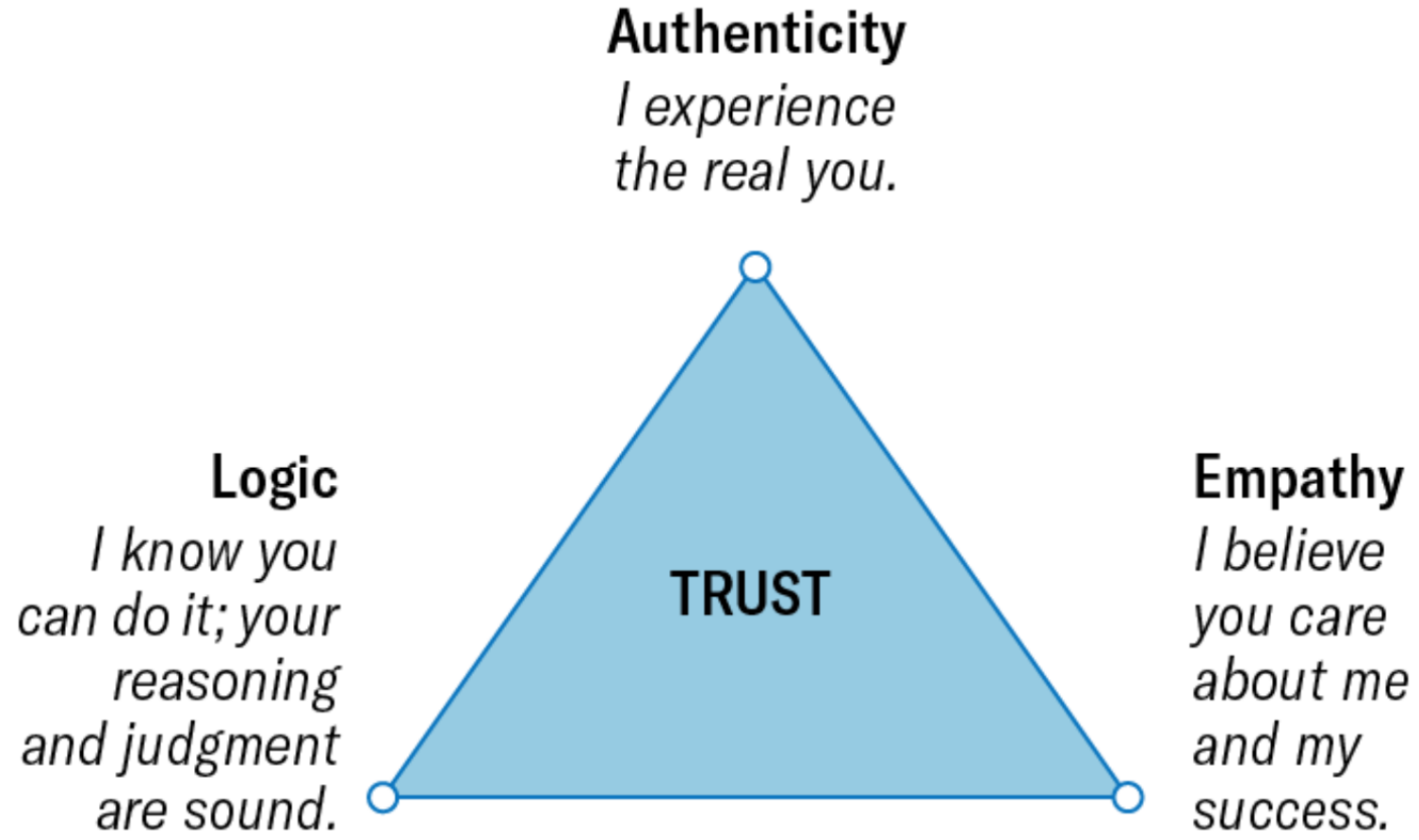
Technology is not enough. Human is still key.

Why AI Can't Replace The Human Touch

"While AI may be able to perform certain tasks with precision, many patients may feel uncomfortable or even frightened by the idea of being cared for by a machine."

-Lorie Brown
EmpoweredNurses.org

The Trust Triangle



From: "Begin with Trust," by Frances Frei and Anne Morriss, May–June 2020

HBR

Thank You!