人工智慧輔助醫療的倫理新思維?

陳彥元

臺大醫院教學部 副主任/教學型主治醫師

臺大醫學院醫學教育暨生醫倫理研究所 教授

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“Artificial intelligence is not going to replace physicians. But those who do not know and utilize artificial intelligence will absolutely be replaced by those who know and utilize artificial intelligence.” (Bertalan Mesko, AMEE 2018)

Artificial Intelligence Technology & RD Guidelines

by Ministry of Science and Technology (MOST) Taiwan, September 2019

The General Principles of Ethically Aligned Design

By Institute of Electrical and Electronics Engineers (IEEE), 2019

Ethics Principles for Trustworthy Artificial Intelligence

By the High-Level Expert Group on AI, European Commission, April 2019

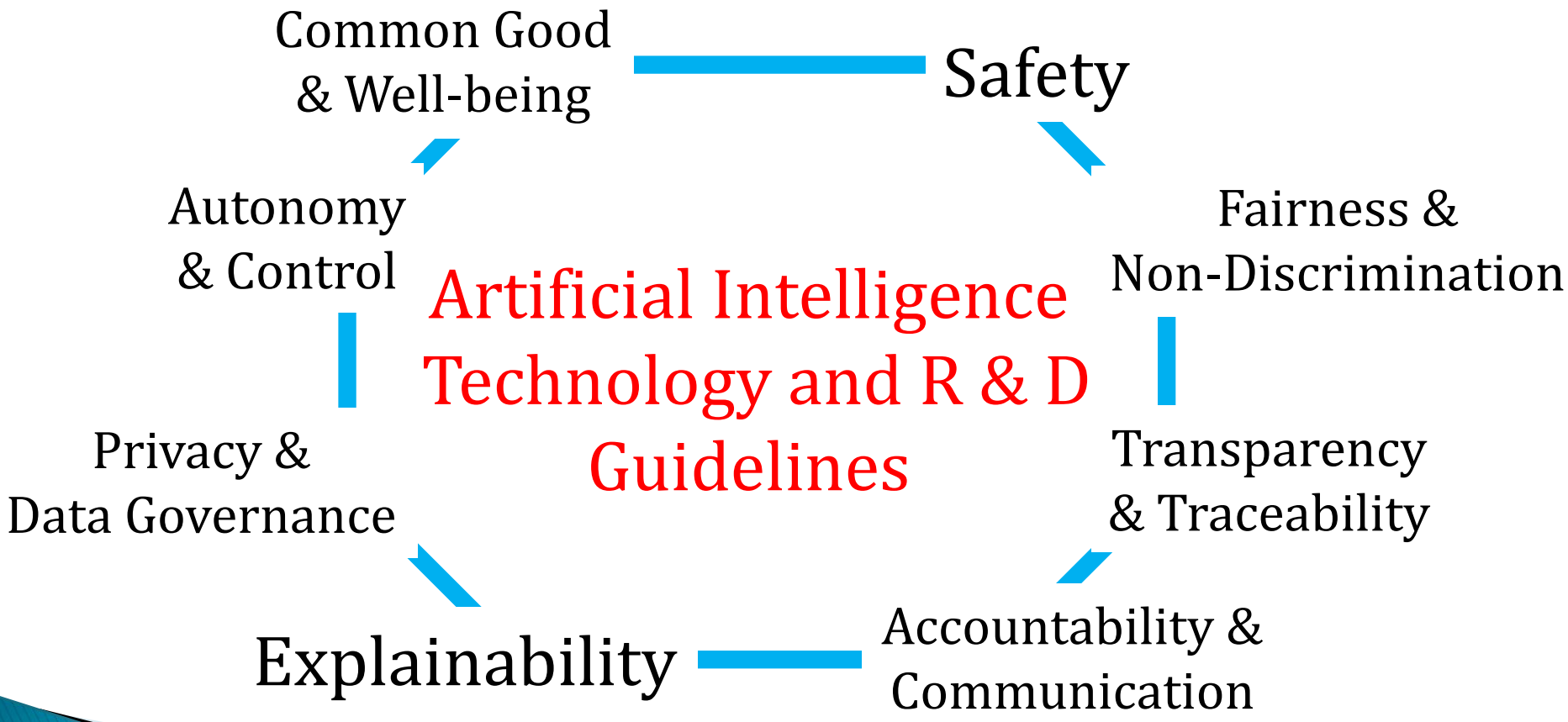
Code for Professional Ethics and Conduct

By Association for the Advancement of AI (AAAI), January 2019

Statement on Artificial or Augmented Intelligence in Medical Care

by World Medical Association (WMA), September 2019

Ministry of Science and Technology



Cores

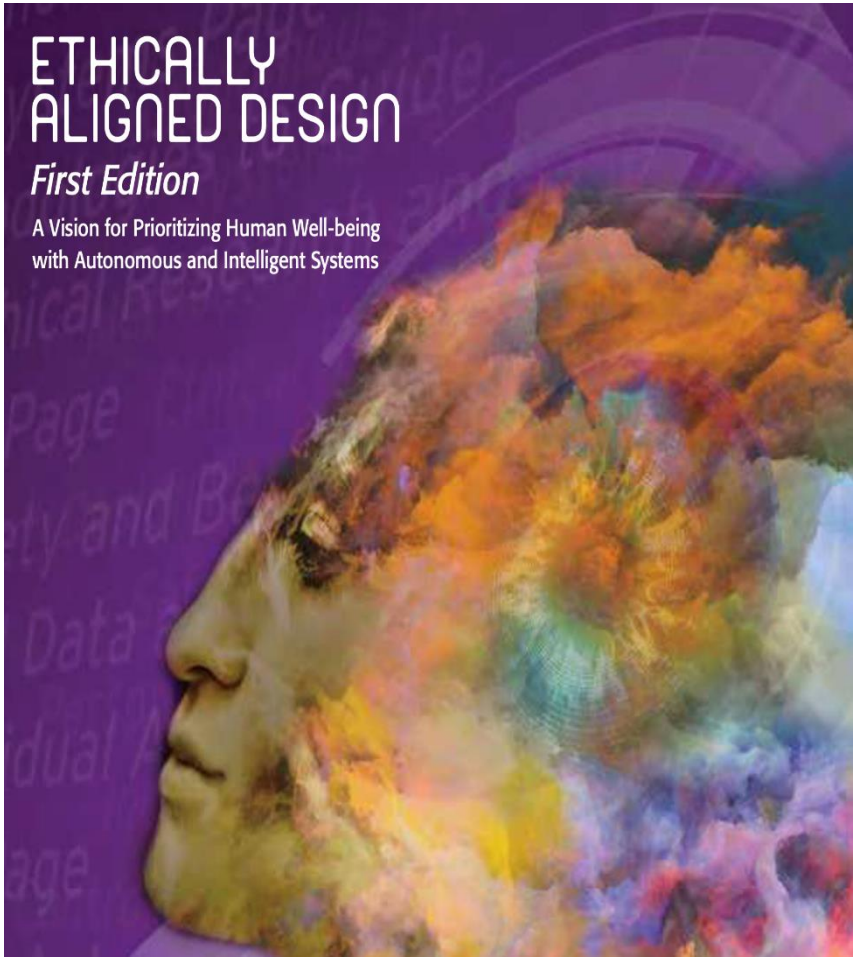
Human-centered Values

Sustainable Development

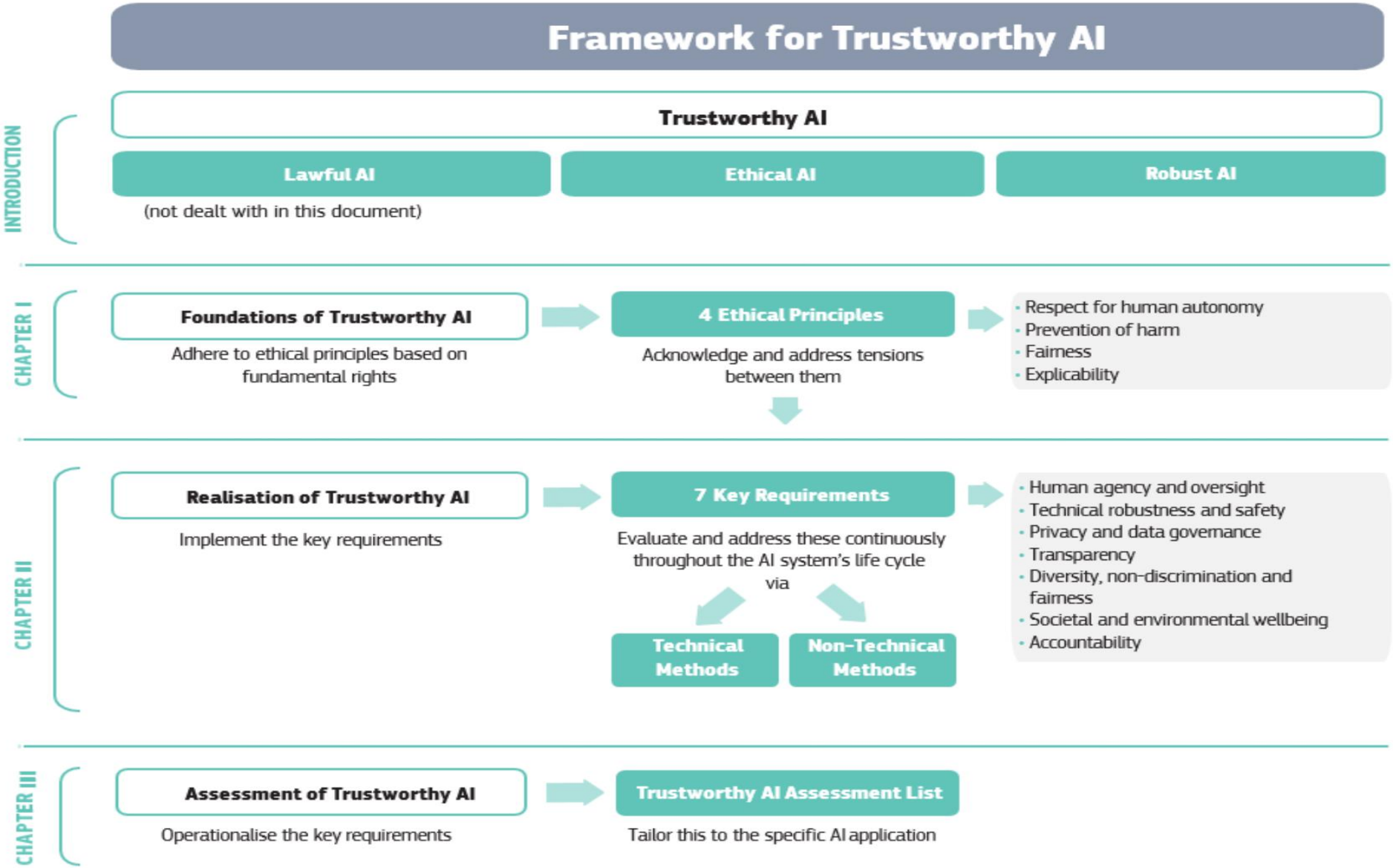
Diversity and Inclusion

IEEE


EAD General Principles
Human Rights
Well-being
Data Agency
Effectiveness
Transparency
Accountability
Awareness of Misuse
Competence


ETHICALLY
ALIGNED DESIGN
First Edition
A Vision for Prioritizing Human Well-being
with Autonomous and Intelligent Systems

European Commission




Human agency and oversight
Technical robustness and safety
Privacy and data governance
Transparency
Diversity, non-discrimination and fairness
Societal and environmental wellbeing
Accountability
To be continuously evaluated and addressed throughout the AI system's life cycle

Association for the Advancement of Artificial Intelligence (AAAI)

This code (the “Code”) is adapted from the Association for Computing Machinery (“ACM”) Code of Ethics and Professional Conduct ("the “ACM Code”) and expresses the conscience of the AI profession.

Target: AI professionals

World Medical Association (WMA)

Statement on Artificial or Augmented Intelligence in Medical Care

Preamble

1. Artificial Intelligence (AI) is the ability of a machine …... The term AI covers a range of methods, techniques and systems…... In health care, as in other sectors, AI solutions may include a combination of these systems and methods.

2. In health care, a more appropriate term is "augmented intelligence", an alternative conceptualization that more accurately reflects the purpose of such systems because they are intended to coexist with human decision-making.

World Medical Association (WMA)

3. An AI system utilizing machine learning employs an algorithm programmed to ….. "training data." …… "continuous learning system" …… "locked learners" …... Being able to trace the source of training data is critical to understanding the risk associated with applying a health care AI system to individuals whose personal characteristics are significantly different than those in the training data set.

4. Health care AI …... In addition to clinical applications, there are many other applications of AI systems in health care including business operations, research, health care administration, and population health.

5. …... it might be hampered by evolving regulatory oversight to ensure safety and clinical efficacy, lack of widely accepted standards, liability issues, need for clear laws and regulations governing data uses, and a lack of shared understanding of terminology and definitions.

World Medical Association (WMA)

6. …… health care AI systems do not replace the need for the patient-physician relationship. Such systems augment physician-provided medical care and do not replace it.

7. Health care AI …… transparent, reproducible, and be trusted …... users' needs …... Physicians will be more likely to accept AI systems that can be integrated into or improve their existing practice patterns, and also improve patient care.

World Medical Association (WMA)

Opportunities

1. Health care AI …… has the potential to make health care safer and more efficient …... The potential also exists to improve the patient experience, patient safety, and treatment adherence.

2. Applications of health care AI to medical education ……

3. There are a number of stakeholders and policy makers involved in shaping the evolution of AI in health care besides physicians …... Physicians should proactively engage in these conversations in order to ensure that their perspectives are heard and incorporated into this rapidly developing technology

World Medical Association (WMA)

Challenges

1. …… ensure proper disclosure and note the benefits, limitations, and scope of appropriate use of such systems. In turn, physicians will need to understand AI methods and systems in order to rely upon clinical recommendations. Instruction in the opportunities and limitations of health care AI systems …... AI systems must always adhere to professional values and ethics of the medical profession.

2. Protecting privacy, control and ownership of patient data is a central tenet of the patient-physician relationship …...

World Medical Association (WMA)

3. Data structure, and integrity ….. may reflect bias and contain errors …… Minorities may be disadvantaged because there is less data available about minority populations ……

4. Liability concerns present significant challenges to adoption. As existing and new oversight models develop health care AI systems, the developers of such systems will typically have the most knowledge of risks and be best positioned to mitigate the risk ……

5. Work is already underway to advance governance and oversight of health care AI …… the United States Food and Drug Administration …… the European Union …… the General Data Protection Regulation; and the Organization for Economic Cooperation and Development …… trustworthy AI systems and proposed specific recommendations for implementation of congruent national policies.

World Medical Association (WMA)

Recommendations

WMA……

1. recognizes the potential for improving patient outcomes and physicians' professional satisfaction through the use of health care AI, provided they conform to the principles of medical ethics, confidentiality of patient data, and non-discrimination.

2. supports the process of setting priorities for health care AI.

3. encourages the review of medical curricula and educational opportunities for patients, physicians, medical students, health administrators and other health care professionals to promote greater understanding of the many aspects, both positive and negative, of health care AI.

World Medical Association (WMA)

Recommendations

WMA urges its member organizations to……

1. find opportunities to bring the practicing physician's perspective to the development, design, validation and implementation of health care AI.

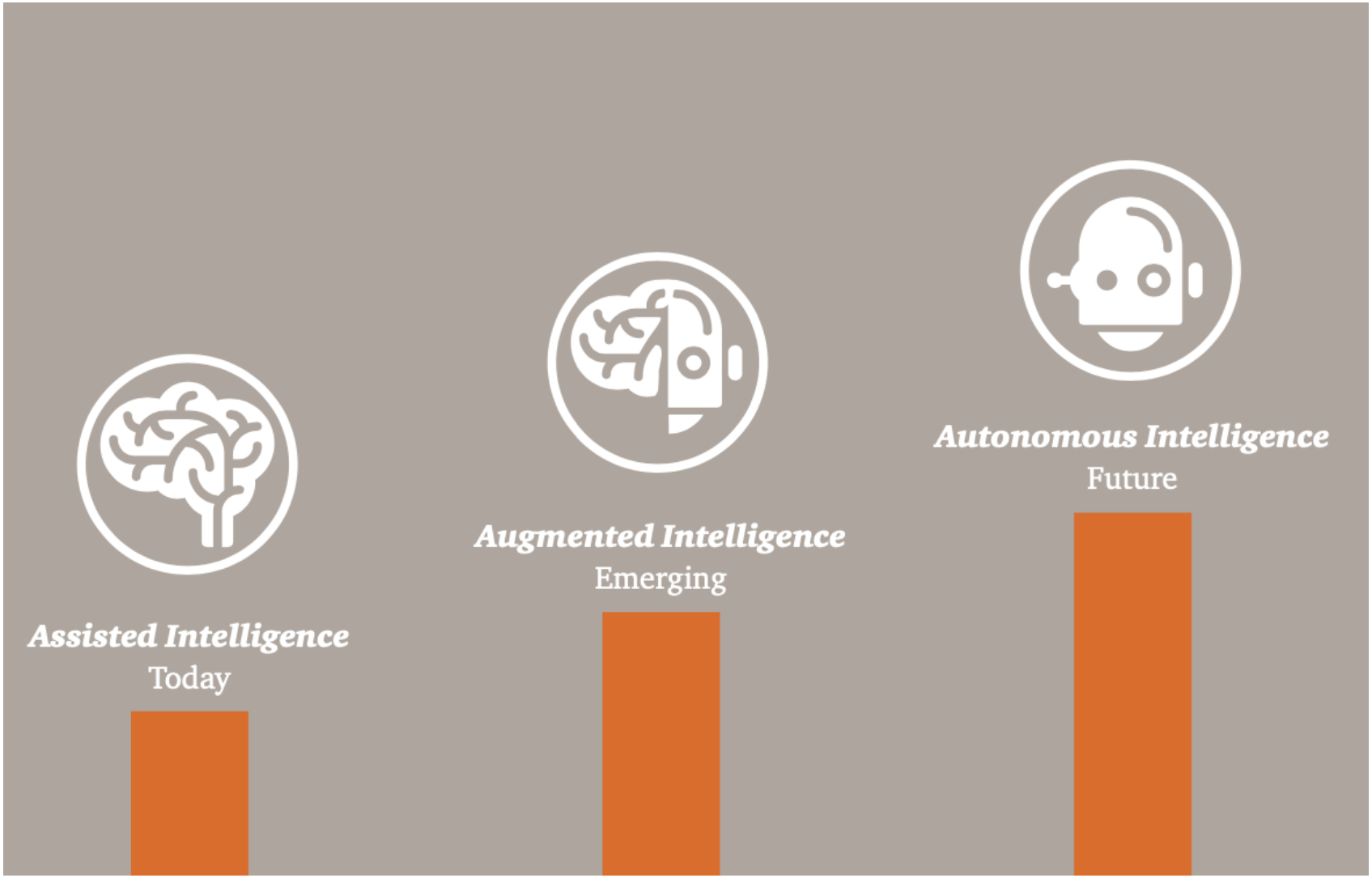
2. advocate for direct physician involvement in the development and management of health care AI and appropriate government and professional oversight for safe, effective, equitable, ethical, and accessible AI products and services.

3. advocate for the primacy of the patient-physician relationship when developing and implementing health care AI systems.

	MOST	IEEE	European Commission	AAAI	WMA
Presented	AI Technology and R & D Guidelines	The General Principles of EAD	Ethics Guidelines for Trustworthy AI	Code for Professional Ethics and Conduct	Statement on A/AI in Medical Care
Report Style	Abstractive Descriptive	Descriptive Abstractive	Descriptive Abstractive	Descriptive Abstractive	Descriptive
Date of Announcement	September 2019	2019	April 2019	January 2019	September 2019
Targeting Stakeholders	AI R & D Personnel	All Stakeholders or Affected Parties	All Stakeholders or Affected Parties	AI Professionals	Physicians
Role of AI	Not Mentioned	Not Mentioned	Not Mentioned	Not Mentioned	Assisting Medical Care

	MOST	IEEE	European Commission	AAAI	WMA
Autonomy & Control	V		V	V	V
Privacy & Confidentiality	V	V	V	V	V
Common Good & Wellbeing	V	V	V	V	
Explainability	V	V			
Accountability	V	V	V	V	V
Transparency & Traceability	V	V	V	V	V
Fairness & Non-Discrimination	V		V	V	V
Safety	V		V		V
Human Rights		V	V		
Effectiveness		V			
Awareness of Misuse		V			
Competence		V			
Trustworthy				V	V
Active Participation					V
Prioritization				V	V
Education				V	V
Academic Integrity				V	
Achieving Excellence				V	

Assisting or Replacing



Professionalization

"all AI professionals, including current and aspiring practitioners, instructors, students, influencers, and anyone who uses AI technology in an impactful way, and is particularly intended to act as a standard of ethical and professional conduct for all AAAI members" (AAAI)

Special and un-replaced expertise
Internal and external recognition
Continuing education
Autonomy
Responsibility

Students?

Public Good

Particularly emphasized

A utilitarian perspective

The danger of the utilitarian perspective:
Dehumanization
Maximizing good morally allows minimizing bad?

Literacy

Media literacy, health literacy, science literacy……

“competence or knowledge in a specified area”

“literacy always includes social and cultural elements”

MOST, IEEE, EC, AAAI, WMA

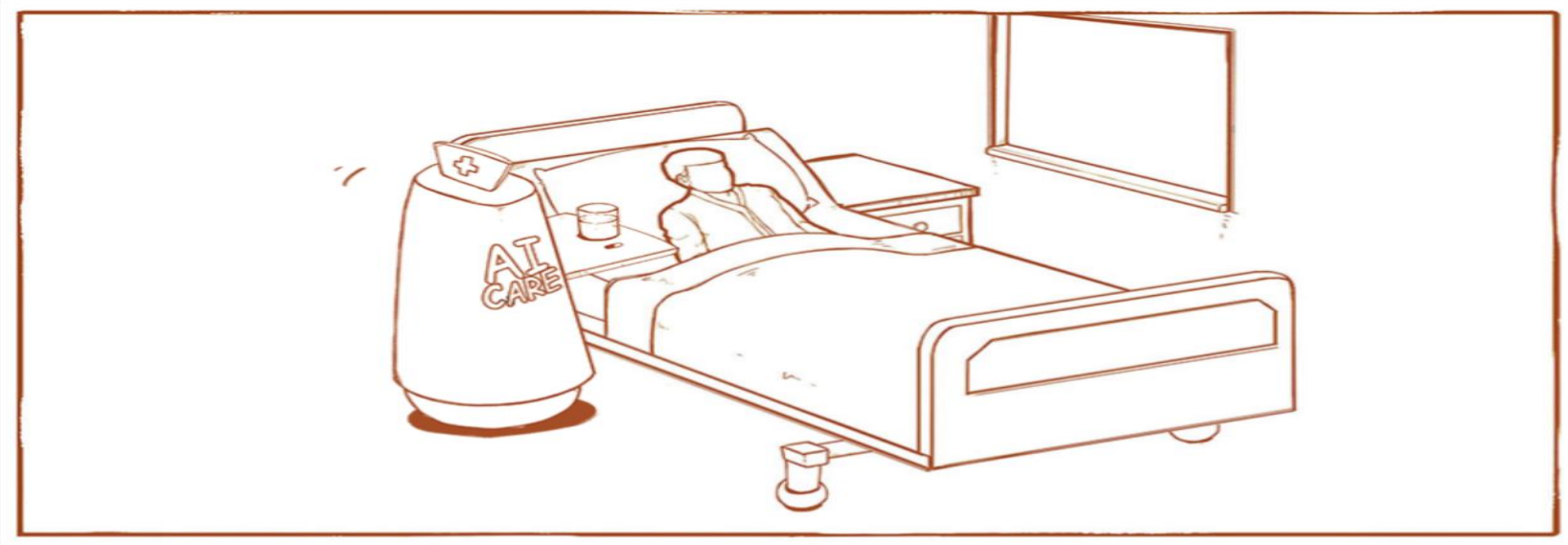
Artificial Intelligence Literacy

機器人三定律

機器人不得傷害人類，或坐視人類被傷害

機器人必須服從人類命令，除非命令與第一法則發生衝突

在不違背第一命令與第二命令下，機器人可以保護自己



強迫

尊重

	(N)	Percentage
Decision totally made by Robotic HCP	191	26.79%
Decision mostly made by Robotic HCP	132	18.51%
Decision-making shared by Robotic HCP and the Patient	25	3.51%
Decision mostly made by the Patient	118	16.55%
Decision totally made by the Patient	247	34.64%

	Coefficient	*P* value	95% Confidence Interval
Patient Age			
0-15	reference		
16-65	0.429	0.003	0.147 — 0.710
66 and older	0.478	0.001	0.191 — 0.765
Has Family Member (0: yes)	0.252	0.032	0.022 — 0.482
Mental Status			
Normal	reference		
Partial Loss	0.064	0.662	-0.221 — 0.348
Total Loss	-0.209	0.144	-0.489 — 0.071
Cured Probability (0: high)	0.104	<0.001	0.813 — 1.275
Gender (0: Male)	0.132	0.265	-0.100 — 0.364
Annual Salary (USD)			
0—17,000	reference		
17,000—33,000	-0.403	0.028	-0.761 — -0.044
More than 33,000	0.045	0.867	-0.484 — 0.574
Marital Status (0: married)	-0.251	0.238	-0.668 — 0.166
Religion			
Agnostic	reference		
Buddhism/Daoism	0.008	0.655	-0.368 — 0.585
Christian/Catholics	0.178	0.222	-0.108 — 0.463

"In the near future, artificial intelligence is not going to replace human beings. But those who do not know and utilize artificial intelligence will absolutely be replaced by those who know and utilize artificial intelligence. Also, those who are working with artificial intelligence, and not aware of the ethical, legal and societal elements of artificial intelligence will absolutely hurt everyone."

Thank You for Listening