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Moving forwards from clinical trials to a more individualized management of treatments in heart failure?

Great value of echocardiography-Doppler data.

Running title: Clustering and individualized medicine

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There are no commercial products involved in this study.

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The management of heart failure has increasingly improved these recent years(1). New therapeutic options emerged. Nevertheless, the prescription of these treatments is not systematic and perhaps has not to be systematic but adapted according to individual specificities(2).

These past years, the relevance of the “heart team decision making process” has been underscored and even recommended by guidelines(1, 3). Heart teams are gathering colleagues, experts, that are supposed to decide based on the clinical files of a patient what should be the optimal management.

It is much more efficient than a decision-making process based on a single view. However, it could be biased by many factors or parameters considered by the heart team or not. The decisions made are most of the time appropriate but the same patient discussed in different heart teams or at different heart team meetings may end up with different medical managements.

Therefore, the risk stratification and the management of complex diseases like the heart failure could take advantage of new approaches. Recently, a demonstration of the value of a “decision support tool” has been demonstrated to improve the appropriateness of the MRA (mineralocorticoid receptor antagonists) prescription(4). An automated, patient-specific, electronic health record-embedded alert is now demonstrated to increase MRA-prescription. It has been validated in a study about 2211 patients using a cluster randomized methodology.

The present work done by Kobayashi et al is going in that direction(5). We can expect from our computers (using large databases and solid statistical algorithms), some help for guiding

us in being more relevant in managing our pat ents. We can get from the clinical file of a dedicated pat ent, some characteristic s, some quantitative characteristic s like to ones we get from the echocardiography-Doppler reports. These echocardiography-Doppler data have a great value in better phenotyping pat ents(6). This phenotyping based on simple measurements, like it is the case in Kobayashi et al work, or more advanced ones (that could be calculated automatically by our echocardiography Doppler soft wares) could help us making a large step towards an individualized pat ent's management(5). The content of these data is huge. The remarkable work reaching to "e'VM algorithm" is nice because it is a really simple and robust echocardiographic data-driven algorithm (based on e', and LV volume and mass). It was first demonstrated to allow for identifying echocardiographic phenotypes with a high risk of developing HF(6). It has been demonstrated for cardiac resynchronization therapy or other disease managements(7, 8). According to Kobayashi et al, we can expect from our simple assessment of the diastolic function characteristic s, a guide for insuring the impact of a treatment on the course of the heart failure(5) (figure 1).

It means that we could better individualized our management. Some pat ents required the MRA and it is nicely demonstrated in the present manuscript. Some are less relevant for this treatment and then might take advantage from other strategies. e'VM algorithm identified pat ents at risk of HF with different characteristic s who had different responses to spironolactone treatment(5). This simple approach is reported to do better than the guidelines and recommendation algorithms. e'VM classification-guided preventive HF trial would be worthy of investigation to ascertain whether this new echocardiographic classification can be applied in a decision support system to identify individuals at risk of HF, and to identify those who are requiring early initiation of specific disease modifying agent(s).

We are at the beginning and many challenges remain but thanks to works like the one done by Kobayashi et al, we confirm that individualized management of medical treatment could be proposed and that could be done thanks to a computer-based guiding. This guiding seems to take largely advantage of cardiac imaging data and echocardiographic ones especially. Authors have really to be applauded for their achievement(5).

Although artificial intelligence has a huge potential to help the clinicians to better stratify the various cardiac diseases risk and to cluster phenotypes that could benefit of precise medicine in terms of management and treatment, several issues remain unsolved. The ethical and regulatory aspects, the selection bias in terms of patients and parameters, and the external validation. Transparency and reproducibility as well as impact on the outcome are often missing too. The next step is to confirm these results on ongoing databases with more gender balance, coming from different sites, or healthcare systems. The clustering should adapt to the moving characteristics of the populations we are dealing with, also to the change in guidelines and the emergence of new therapies. The algorithm should be regularly retrained and revalidated. Coming back to cardiac resynchronization therapy (CRT), it has been observed how the guidelines have been relatively stable over the years but the characteristics of treated patients has changed because the phenotypes of our patients is rapidly changing (9). Clinical decision support systems embody one of the eagerly awaited applications of artificial intelligence and machine learning for patient care(10). By leveraging the power of “big data,” these technologies promise the most effective practice effective medicine ever(11). Nevertheless, artificial intelligence algorithms, or the decision support tools alerting clinicians to their complex outputs will still largely depend on small to moderate size of the validating cohorts.

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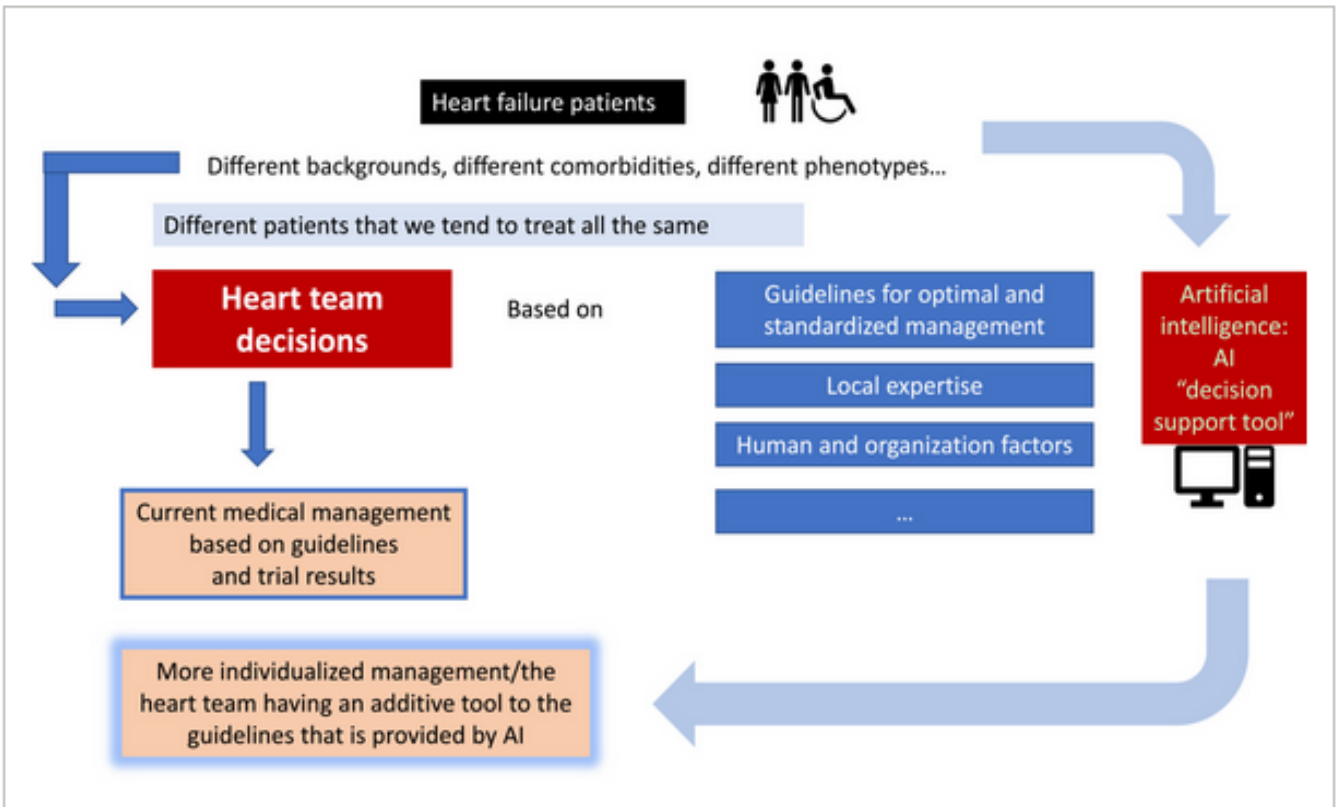


Figure 1

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[PowerPoint](#)

Summary of how artificial intelligence (AI) could help.

