

Hypertension Modules Comparisons to NICE Guidelines

Data Science

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Synthea is heavily US based, including its titration modules for hypertension, and so some investigation needs to be done on how appropriate this is for UK healthcare and whether it aligns to the [NICE guidelines](#)¹. Following on from that, an investigative piece is required to figure out how easy adapting the modules to the UK guidelines would be.

¹ <https://www.nice.org.uk/guidance/ng136/chapter/Recommendations>

1 What is Synthea and what is a basic explanation of how it works and what it does?

[Synthea](#)² is a tool for generating synthetic patient data in a variety of formats. It was initially developed by a large range of US-based researchers and clinicians in 2017. It provides several different models of disease progression for the 10 most frequent reasons for primary encounters in the US, as well as the 10 chronic conditions with the highest morbidity.

Synthea is a heavily modular piece of software, meaning it's relatively easy to change or introduce models of disease progression, changing demographic risk factors for hypertension to reflect a particular population of interest. These individual models of disease progression were made in collaboration with clinicians, as well as making heavy use of publicly available statistics in the US.

This modular nature of Synthea does have some drawbacks though. As far as we can tell from the surrounding literature and its source code, Synthea is not capable of modelling the cross correlations between different comorbidities e.g. between diabetes and heart disease for example.

However, even with this limitation Synthea is still capable of producing large amounts of rich synthetic patient data, which while not capturing the complex interrelations of real disease progression, looks superficially quite convincing.

Synthea can output its synthetic patient records in a variety of international formats such as FHIR. It is also capable of outputting data in a simple csv format. It is hoped that we could take this csv data, and with some preprocessing, get it into a format suitable to be fed into SystemOne or EMIS.

² <https://academic.oup.com/jamia/article/25/3/230/4098271>

2 Hypertension Module

<https://synthetichealth.github.io/module-builder/#hypertension>

The hypertension module in Synthea incorporates diagnosis of hypertension, from the point of going for a general check-up and high blood pressure being detected, to diagnosis of hypertension, to hypertension management, including life style changes and recurring check-ups, up to the point of controlling hypertension or being referred to a specialist instead. The medication titration is extracted out into its own module which will be discussed later.

- This module includes a set of lifestyle modifications, which are slightly different to those described in the NICE guidelines:
 - Recommends alcohol counselling which is not included in NICE.
 - NICE includes recommendations on weight management and caffeine management which are not included in Synthea.
- The rest of the pathway is relatively similar to the one in the NICE guidelines and so can most likely be reused.

3 Hypertension Medication Sub-module

https://synthetichealth.github.io/module-builder/#medications/hypertension_medication

At the point of starting hypertension management, Synthea calls on the hypertension medication submodule that deals with medication titration. This is a significantly different process to the UK version (included in NICE), with differences such as:

- No consideration of diabetes for decisions on which medication to prescribe.
- No consideration for people who refuse meds.
- No home blood pressure measuring included.
- Synthea has three steps of hypertension medication; NICE guidelines have 4.
- Synthea has more consideration for whether blood pressure is 'high' or 'very high' whereas the NICE guidelines don't make this distinction (unless it's high enough to be considered an emergency and then they're not titrated this way).

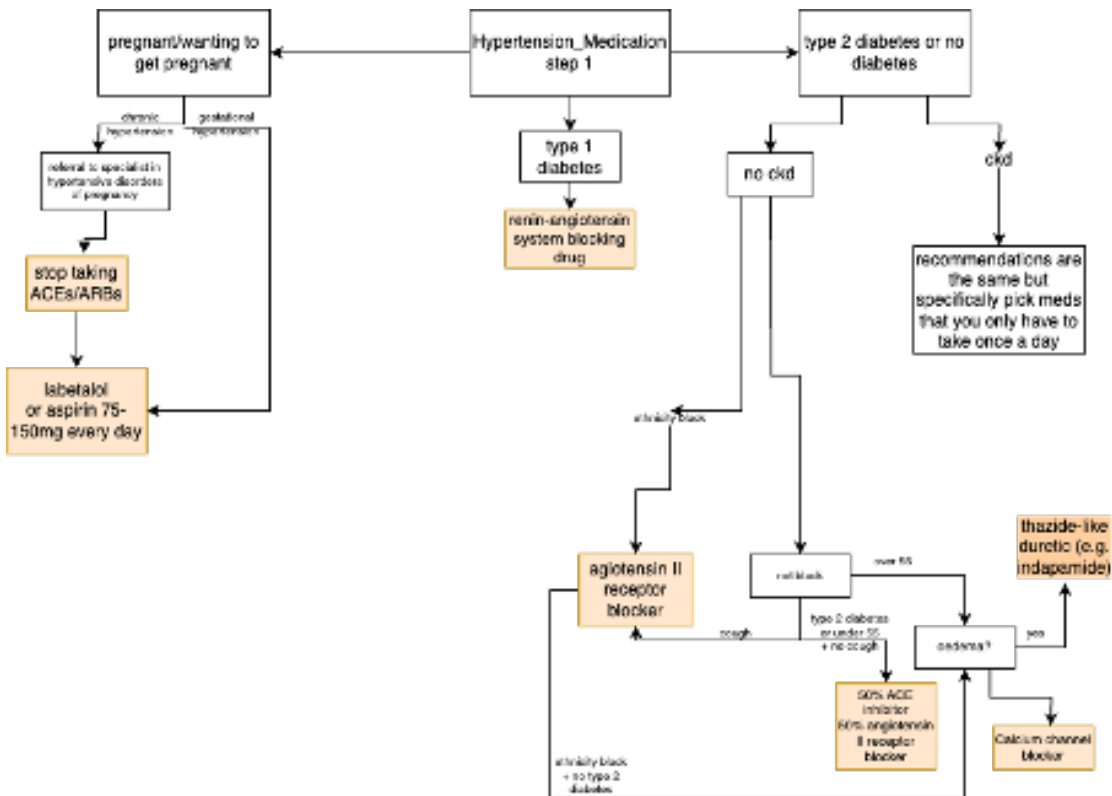
As an alternative to the Synthea module, I have created some flow charts for the steps of hypertension medication, following the NICE guidelines. According to the documentation sent to us by John, the time between these 'steps' and appointments will be 4-6 weeks. These flow charts can be found in the appendix.

4 Adapting Synthea modules

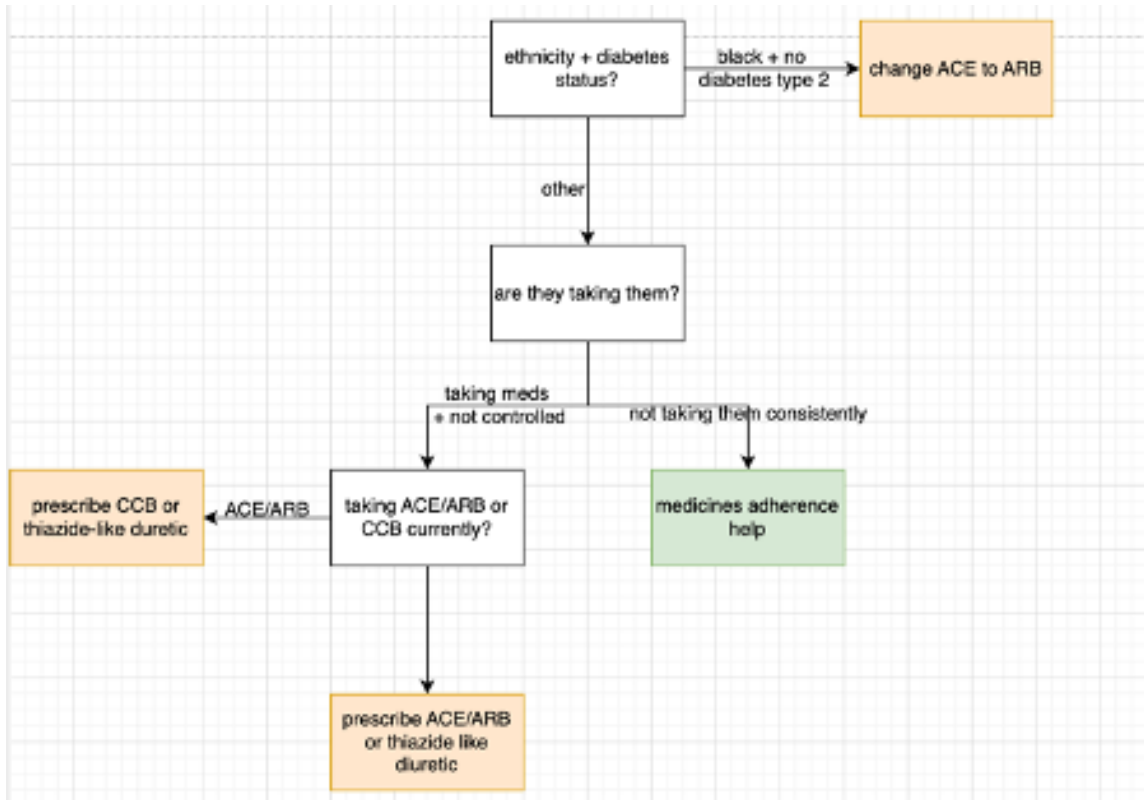
After a preliminary examination, we believe that it would not be too complicated to adapt the Synthea modules to have these different considerations, however we are missing some key information, such as what types of ACE and ARB drugs are prescribed in the UK, or how frequently each type is prescribed, and other considerations. We would most likely need to work with a clinician to get this sort of information, but can start off with basics that can then be easily edited.

5 Appendix

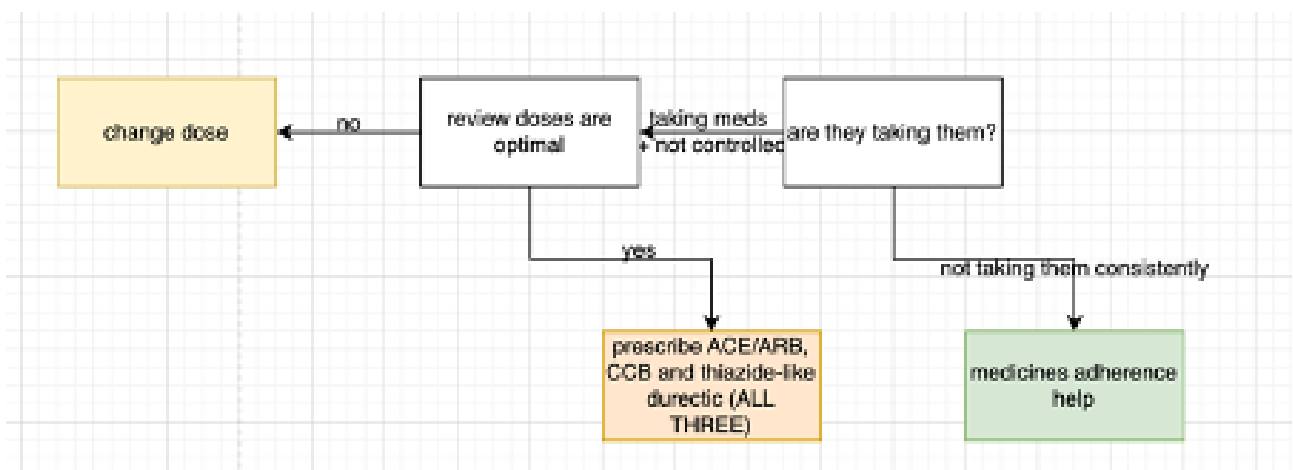
5.1 Step 1



5.2 Step 2



5.3 Step 3



5.4 Step 4

