Technology can revolutionise supported self-management of asthma

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Asthma is a variable and unpredictable condition. Over the course of a year a patient's asthma control may vary several times necessitating an alteration of behaviour and treatment to prevent a life-threatening asthma attack. In the limited time afforded to an asthma review it is important to help patient to understand their asthma, their triggers, their symptoms and their treatment. Someone with asthma needs to be supported to understand the behaviours that are needed to keep their asthma stable and crucially what actions are required when their asthma becomes unstable.

Sharing a written asthma action plan is associated with a significant reduction in admissions.[1] The success of a written plan depends on so many factors but ultimately comes down to whether the patient retains it, has it with them and follows the instructions. Many patients are given inadequately completed or no written asthma action plans.

Technology has the potential to transform how we view supported self-care. Primary care and community pharmacists can use readily available data to perform risk stratification and to identify reliever overuse and preventer underuse - these should be prompts for tailored medical and educational interventions.

Written asthma action plans can be created and shared electronically, or at a minimum stored as a photo on the ever-present smart phone. Most GP IT systems in the UK enable clinicians to communicate to their patients by SMS or email. These can be useful for alerts and reminders but also for sharing key information (flu clinics, Asthma UK webpages, links to inhaler videos).

There has been an exponential rise in the use of portable, connectable electronic devices including the smart phone over the last 10 years. The increasingly intelligent way that technology interacts with us means that we need to be prepared for technology-led healthcare to not only become a reality but for healthcare systems and workforces to be redesigned around them.[2]

Healthcare can harness developments in technology along with a greater understanding of human behaviour to support self-care in a consistent, evidence-based, personalised and timely way. We can find ways to interact and create behavioural nudges even with the most poorly engaged of people.

Some of the technologies shaping the future of healthcare

Smart Devices: Sensors attached to existing inhalers or peak flow meters. These might record when the device is used, how well it is used and even location. These have been widely used in research but are being developed for clinical use. Some Smart Inhalers exist that identify biomarkers, pollens, air quality or can vary medication dosage. Data can be sent to an app on the user's smart phone or even healthcare IT systems.[3,4]

Social media: Social media is not new but is getting more insightful. It can assimilate information that you readily provide, along with your online contacts and behaviours. Social media is constantly picking up information about the user and translating that to personalise what you are exposed to. Facebook and Twitter make suggestions for holidays, clothing and even friends, and is becoming central to marketing strategies[5] – not just by the retail industry but also by people who want to influence behaviours.

Artificial intelligence (AI): This is the ability of computer systems to work through complex algorithms based on increasing and ever-changing data. The most common examples cited are of games such as chess where the machine not only understands the implications of what every sequence of moves might mean but then learns from successes and mistakes not just in their own game but by the opponent – meaning the machine has learnt how to have an even better chance of winning next time. Google's AlphaGo taught itself the rules of 'Go' and then taught itself to win.[6]

Applied to healthcare AI has the potential assimilate the 1000's of new pieces of research produced

every day, bring together seemingly endless measurements and markers of health on each individual person and then tailor this new information to inform healthcare decisions.

Natural Language Processing developments now allow AI to interpret the relevance of specific words to individuals.[7] Computers can start to patterns of language eg 'My asthma is bad' 'my asthma is killing me'. Natural language is important not just in understanding context but also in how we (or AI) communicate back to the patient to enhance understanding.

Algorithmic medicine: Every day, healthcare professionals work through 100's of algorithms in their heads. Some based on evidence or guidelines and some based on clinical experience and their knowledge of the patient. Computer software can support healthcare professionals (and patients) to make evidence or value-based decisions by making suggestions. There are many areas of medicine (and particularly in respiratory care) where greater use of supportive algorithms can improve outcomes for the patient and for the health system.
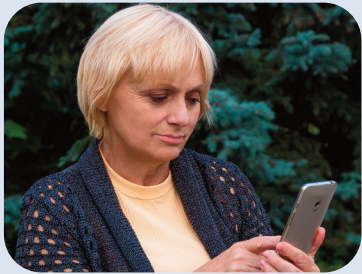
Chatbots: In its most basic form a chatbot is an algorithm that interacts through text or voice.

As AI is utilised, the algorithms can not only become more complex but can start to make use of wider sets of data to make the algorithm more relevant and accessible to the user: personal data (peak flows, medical history), behavioural data (how someone interacts with their devices, with their condition and even how someone responds to different information eg does someone read long webpages, skims headlines, watches videos and what hooks them in) and data such as weather, air quality.

Internet of things: The Internet of things (IoT) is the network of physical devices, vehicles, and other items embedded with electronics, software, sensors, and network connectivity which enable these objects to collect and exchange data. Devices will start sharing data with each other and feed into algorithms that can support people to stay healthy.

Case study

Linda is a 57 year-old lady with asthma. She says she doesn't like technology much but does have a smart phone because everyone else does. She does use it to keep in touch with her family on Facebook and sometimes uses it to browse the internet. Linda thinks that her asthma is well controlled and does what she needs to do to stay well throughout the year.

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	Linda's supported self-care now	Linda's technology supported care
Written asthma action plan	Linda has a written plan for her asthma. She even carries a photo of it on her phone because she doesn't like carrying around a piece of paper.	Linda's plan is uploaded to her phone. Not only is it useful for Linda to know what to do, but it responds to her symptoms and reliever inhaler use to prompt her when to take action.
Annual asthma review	Most years Linda takes time off from work to see her asthma nurse for her annual review. Usually her asthma is well controlled when she goes to the appointment and sometimes she doesn't feel like she gains a lot from the visit.	Linda's asthma is continually being monitored by her smart inhaler and asthma platform. Her nurse contacts her at intervals throughout the year via a chatbot to see how she is doing but more often where there are increased symptom or reliever use or around the times of year when she has struggled in the past. The chatbot recognises the words and phrases that Linda likes to use and learns to understand their relevance, often reflecting them back to her in messages to enhance Linda's understanding.
Asthma triggers	Linda knows that she is allergic to pollens and dogs. She sometimes remembers to take an antihistamine if she knows she is going to be exposed to these triggers.	Linda's Facebook feed contains prompts from Asthma UK about pollen levels and high pollution. Her platform automatically connects to sensors at home and throughout the community that detect air quality and common airborne triggers.

Linda's supported self-care now	Linda's technology supported care
She also struggles with high pollution levels. There are some good tips on the Asthma UK website but she usually reads these after a day of struggling with symptoms.	Her phone suggests taking an alternative route to work to avoid the worst areas. It has also noted the locations which have led to reliever inhaler use and recommended preventative action.

Asthma Attack

Linda knows to take her blue inhaler, up to 10 puffs if she needs it. Luckily, she hasn't needed to do this in the last year. She has her written plan on her phone just in case she needs to check what to do next.	Linda has a prolonged coughing episode when she had a virus. Her platform (could be via Siri or Alexa) coached her through the self-management of an asthma attack. It also called for an ambulance to her location when she didn't respond to the first 10 puffs.

Monitoring by GP practice

Linda's GP practice note that she requested 6 salbutamol inhalers over the last 12 months. No action was felt to be required by her GP practice. Linda knows her blue reliever inhaler is very effective. She uses it occasionally when she has a cold. Last June she finished 2 blue inhalers in a month and uses 2 more over the rest of the summer. As the blue inhaler worked she didn't need to bother her GP.	Linda's phone/activity tracker provides her with feedback on her activity, sleep and behaviour patterns. She gets information about when and where she is using her reliever inhaler, suggesting solutions to improve her asthma control (avoiding triggers, better adherence). Linda's smart inhaler highlights to her and her asthma nurse when she is using a lot of her reliever inhaler. A chatbot finds out some more information and arranges a call by skype or a face-to-face appointment at a convenient time depending on the severity of the symptoms.

Understanding asthma

Linda is given a print out of written information about what asthma is and what her medicines are for. She has also searched the Asthma UK website and has found a few pages that seem relevant to her. There are lots of other pages too but will come back to them another time (probably). A lot of her understanding of asthma comes from family and friends who share their experiences. She tried joining an online asthma forum but found that most of the contributions came from people with what sounded like very severe asthma or were complaining about the NHS or their medicines. It did make her sceptical about her preventer medication and falsely reassured her that her asthma wasn't very serious.	Linda is directed to a range of online resources that might suit her. Quite quickly her preferences for video clips and short snappy summaries are recognised by her IT systems though she regularly delves into longer articles, case studies and blogs where it catches her attention. She is an avid Facebook user and hasn't noticed that since she 'liked' the Asthma UK Facebook page she receives nuggets of information at important times. She finds some of them really useful. Her asthma platform has recognised the patterns of her asthma symptoms, behaviour and use of language and shares key bits of self-care information at the right time and in the right way for her. It has also learnt what Linda's preferences are so that it doesn't send too many notifications, but does send them at a time when she seems to engage best. Linda is also linked to a larger, virtual community. Though she does not know it, she is clustered with people of a similar behavioural and asthma phenotype that will give her the relevant support that she needs. A combination of her asthma platform understanding her own patterns of asthma, her behaviours and the topics she engages with online creates new preferences for the asthma information that is suggested to her.

Continued…

	Linda's supported self-care now	Linda's technology supported care
Taking her medicines	Linda is really good at remembering her medications. She keeps her inhalers in the kitchen where she remembers to take them. Sometimes, during holidays and at weekends the change in routine makes her forget. Sometimes Linda doesn't order new inhalers in time and goes a few days without her medication. She thinks her inhaler technique is quite good. It has been checked at most of her reviews at the GP surgery and once by the pharmacist. They always tell her that she is inhaling too fast so she tries to do better.	Linda's phone recognises her routine, and notices from her calendar when her routine might change. She doesn't get reminders every day but at weekends she gets an alert, usually when she is near the kitchen. On the occasional day when she does forget to take her preventer she gets an alert before she leaves the house. Linda's phone tells her when her inhaler is running low and enables her to order more on-line. They get delivered to her home the next day. She never runs out. Her smart inhaler not only sends signals to her phone when it has been used but also gives feedback on how good her technique is. Occasionally she gets directed to the Asthma UK video of someone using her inhaler or gets interactive coaching via her platform.
The right medicines	Linda's asthma nurse increases her inhaled steroid medication but is not certain whether to believe she is fully adherent with her preventer medication. Linda does not return for follow up as she feels better. She is a little wary about the higher dose of the steroid inhaler so takes one puff instead of two.	The asthma nurse gets data outlining Linda's adherence, technique and triggers. She has confidence to increase or decrease medication when necessary and can arrange a chatbot follow up after a few weeks to check how the medicines are suiting her. Because she has more information about Linda's asthma and behaviours, treatments and interventions can be individually tailored much more easily. She also receives a reassuring video from Asthma UK discussing the importance and safety of steroid inhalers in asthma. Linda is looking forward to the introduction of a new Smart Inhaler that automatically adjusts her medication dose depending on her risks, triggers and exhaled biomarkers. She hopes this will mean she will only ever take the lowest possible dose of inhaled steroid.

Although Linda's case was theoretical, all of the technologies and digital interventions are possible right now. Regulations around data sharing and technology, clinical and information governance, interoperability and a re-configuration of healthcare are required to make this happen. By achieving this we can support self-management for all people with asthma especially those hardest to reach.

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Breathe Easy Patient Support Groups

Mike McKevitt, Head of Patient Service, British Lung Foundation

In conversations with both patients and respiratory healthcare professionals we regularly hear how much they value our British Lung Foundation Breathe Easy patient support groups. They recognise the value of patient peer support groups for improving patient outcomes.

We understand the importance of keeping patients with life-limiting conditions motivated and positive. People who have low levels of mobility are less likely to play an active role in staying healthy. They are often socially isolated, not confident enough to seek help when they need it and may have difficulty following advice. Managing their own health can be a struggle: this is where patient peer support groups like Breathe Easy can step in. Here healthcare professionals provide a place where patient can share experiences, improve their emotional health, well-being and sense of belonging.

These groups are essential to the aspiration of providing person centred care for our patients. Peer support groups have a key role to play in terms of building patient confidence, knowledge and skills. They encourage supported self-management, ultimately bringing the aspiration of effective person centred care closer to reality.

This view is supported by a 2016 University of Kent study into our Integrated Breathe Easy network. It found that the groups improve patient outcomes, reduce hospital admissions and save the NHS money. The aim of the two-year study was two-fold. Firstly, a process evaluation to look at barriers to integrating a support group into a respiratory care pathway. Secondly, an economic evaluation to measure impact on physical/ mental wellbeing and the benefits to NHS services. The effects of attendance at a group integrated into the respiratory pathway were substantial with 57% reporting a reduction in unplanned hospital admissions and a 42% reduction in unplanned GP visits.

The conclusion was that the support groups are a cost effective programme; for every pound invested in integrated support groups there is a minimum of £5.36 in net gain through a better quality of life health for participants. In summary, support groups provide positive outcomes in terms of health and wellbeing for attendees, providing cost savings and wider social benefits to local communities.

In our experience a network of support groups works best where healthcare professionals, clinical commissioners and the BLF work collaboratively. This will ensure activities are properly integrated into the local respiratory care pathway. The aim, where this happens, is to reduce the burden of lung disease on both the individual and the local health economy.

So how is this achieved and what happens at a support group meeting? Breathe Easy group meetings aim to ensure:

- Members share experience and knowledge. The benefits of learning from one's contemporaries and peers. Attendees are experts by experience, they talk in a language everyone understands in an environment where people are comfortable and more likely to ask questions.

- Peer support where patients find ways to support each other. This can be practical or emotional support or sometimes advice or strategies on living better with their condition.

- Education and instruction with a self-management focus from the BLF and from a variety of healthcare professionals. Groups provide the opportunity for every member of the multidisciplinary team to see a large number of their patients in a single hit and to get key messages across.

- Signposting to other local relevant support services including social care or other voluntary organisations.

- Patients are supported to use their voice to review and improve local services. Patient groups provide the ideal forum for providers and commissioners to explore challenges and potential solutions directly with their service users.

The outcomes for patients include:

- a better understanding of their lung condition

- an increased awareness of what to do when things go wrong

- increased medicine management and compliance

- increased opportunities for social contact (reduced isolation), increased confidence

- a better understanding of health services

- confidence, knowledge and skills to self-manage or self-care

We have found that the scope of activities at support group meetings diversifies as patient numbers grow and individual member confidence increases. Opportunities for maintenance exercise sessions following completion of a pulmonary rehabilitation programme are increasing with 30% of our groups now offering some form of exercise session in

addition to their traditional activities. Walking groups, Thai Chi and singing for lung health activities are also growing. This indicates a desire amongst our patients to try different activities.

There has been less research on the effectiveness of singing groups or other innovative activities. However, what is clear is that if people want to improve their health outcomes they need support to do so.

There is also an increasing body of quantitative and qualitative evidence to show the positive impact such groups can have. As one patient told me: "My Breathe Easy group has been a lifeline for me. It has enabled me to go out in public with more confidence and has empowered me to live my life to the full."

If you would like to refer your patients to their local Breathe Easy group or set one up if you don', you can find a full list of them here www.blf.org.uk/BreatheEasy If you don't have a Breathe Easy group but would like to set one up talk to our group support team on 03000 030 555.

There are lots of other opportunities for us to work with you to help improve your patients skills, knowledge and confidence, these include:

- Our Helpline - free advice, information and support available from respiratory nurse specialists and specialist welfare benefits advisers (03000 030 555)

- BLF web community – an on-line respiratory health forum with over 26,000 members **www.healthunlocked.com/BLF**

- Singing groups **www.blf.org.uk/support-for-you/singing-for-lung-health** and exercise classes **www.blf.org.uk/support-for-you/keep-active**

- Our patient information and literature free to order on line **www.blf.org.uk/page/conditions**

- Our web site and social media feeds **www.blf.org.uk** @lunguk or **www.facebook.com/britishlungfoundation**

- Our self-management products for patients and professionals which can be ordered here **www.blf.org.uk/Page/Stay-in-control-of-your-lung-condition**