FACEREMELIUS

Independent investigation

of the death of Jack Last in April 2021 after receiving the Oxford AstraZeneca vaccination

September 2024

Contents

Foreword

A coronavirus pandemic started in December 2019. The first case recorded in the UK was on 31 January 2020, and in the months that followed, the NHS faced unprecedented levels of demand. In March 2020, the country was placed in a three-month UK-wide lockdown.

Following the emergence of COVID-19, the global research community demonstrated unprecedented urgency, accelerating vaccine development processes by simultaneously completing stages of development and exploring new vaccine technologies.

In late December 2020, the Oxford AstraZeneca COVID-19 vaccine was approved for emergency supply in the UK. The first doses were released on 30 December so that a UK-wide vaccination programme could begin early in the New Year.

A national campaign ensued, driven by the positive intent of encouraging everyone to get vaccinated. The health and care secretary's words, “Vaccines are the best way of securing our long-term freedom and will save thousands of lives, so I urge everyone to take up the offer when the text pings into their phone,” echoed this hopeful sentiment.

On 20 March 2021, Jack was invited to be vaccinated; five days later, he booked his appointment for the morning of 30 March. A week later, he started to feel unwell with a severe headache and disturbed vision. On 9 April, with little improvement to his symptoms, he called NHS 111; he was admitted to West Suffolk Hospitals NHS Trust; two days later, he was transferred to Addenbrookes Hospital in Cambridge, where he sadly died from Vaccine Induced Thrombocytopenia (VITT) on 20 April 2021.

An inquest was held into Jack's death in December 2022, where the coroner concluded that Jack died of a blood clot to the brain caused as a direct result of his body’s reaction to the Oxford AstraZeneca COVID-19 vaccination.

This investigation has been a tragic case of a young, healthy male who developed complications following his Oxford AstraZeneca vaccination and sadly died. My colleagues forensically followed the evidence to understand why and how he was called for his vaccination.

The investigation, a testament to its complexity, involved eighteen stakeholders and five specialist clinical advisers. In particular, the process of finding clinical advisers with credible clinical experience treating patients presenting with VITT was a challenge. I regret and apologise to Jack's family that it has taken over three years to conclude and publish this report, am attestation to the thoroughness and dedication of the team.

The events and findings are challenging to read, especially for the family. In 2010, eleven years prior, one of Jack's parents, unbeknown to them, had a diagnosis recorded in their primary care record, which led to the parent being classified into cohort six for the COVID-19 vaccination, adults aged 16 to 65 in an at-risk group.

In March 2021, in Suffolk, there was an increase in vaccine availability whilst there was a diminishing eligible population. The then Clinical Commissioning Group, a local NHS organisation responsible for planning and commissioning healthcare services, sanctioned a search for people who lived with those classified as cohort six, this was identified by matching landline telephone numbers. This returned Jack as a match to someone in cohort six, and he was duly invited for the vaccine.

When leading any investigation, it is essential to understand and remember the context of living at the time and to consider the local rationality of why decisions were made. In the case of Jack's vaccination, the local rationality involved the urgency to vaccinate as many people as possible due to the rapid spread of the virus whilst having a diminishing eligible population to be vaccinated, in line with the national cohorts.

Time fades our memories of what it was like in 2021 and how vaccination centres were set up quickly; never before in the history of the NHS had a UK-wide vaccination programme been set up in such a short time frame with the ambition of vaccinating a population of 67 million people.

Pandemics are becoming more frequent; therefore, we must understand the opportunities for learning and improvement in Jack’s care and treatment. A group of highly experienced clinicians has considered my recommendations.

Opportunities to learn in this case include;

- the importance of primary care coding of diagnosis in patient records, differentiating when a diagnosis is still active or should be considered to be ‘resolved’

- the administration of phone numbers in the primary care setting, the form Jack used was a paper form and did not prompt patients to ask for telephone numbers no longer in use to be removed

- when a new disease emerges, how is guidance developed and disseminated nationally quickly, ensuring those who gatekeep access to services have the latest information?

- how primary care clinical systems support the recording of a deceased patient to ensure the Personal Demographics Service is updated whilst enabling a GP practice to update and administrate the deceased’s record. This would ensure appointment and vaccination letters addressed to the deceased are no longer sent.

I want to thank everyone who met with me and my colleagues and shared their recollections of the events in 2021. I also want to thank the stakeholders who cooperated with transparency and openness in this investigation.

Finally, I hope the COVID-19 inquiry considers the lessons from this report and shares them widely with all relevant agencies and providers to ensure learning across the health and care system.

Darren Thorne, Lead Investigator
August 2024

Statement from Jack's family

This statement isn't something any family would expect to make. However, sharing the horrific ordeal that Jack was put through is something that must be done to highlight the litany of errors that have cost Jack his life.

Jack was a happy, healthy, carefree 27 year old. He had thick brown hair, big brown smiling eyes and a kind smile. He loved his job, working as an engineer for Caterpillar machinery and was also putting his skills to use working on an old car in his spare time. He loved seeing his family, his friends, keeping fit and exploring. He was witty, entertaining and always kind to everyone he met. Jack had previously taken a 6 month career break to work with machinery in Antarctica for the British Antarctic Survey, he completed several Tough Mudder challenges and could often be seen at his local park run. For Jack, life was worth living, and he made the most of every moment.

Before Jack had his Oxford Astrazeneca COVID-19 injection, he hadn't had a single day sick from work. He was very rarely unwell. Then suddenly he was not fine. It all happened so quickly, it still struggles to hit home at times that we are never going to see him again. Conversely, the time from him being invited for his Oxford Astrazeneca COVID-19 injection, to dying, somehow also seemed to last forever, waiting to hear that actually, he would be OK. But of course he was not OK and none of this will ever be OK.

As a family not directly involved with the NHS or the vaccination programme, we had little knowledge of the COVID-19 vaccination process except the usual as broadcast on the news; the vulnerable and very elderly in each area were being vaccinated first, then the vaccination programme would work it's way down through the age groups. So when Jack got called, this was not a surprise to him or us, we just assumed his area had got to his age group, as this fitted with the ages of those we knew had received their jabs. I (Jack's sister) still remember him telling me he'd got his text, lightheartedly saying to me his area was ahead of mine, so he would get his injection first despite me being old (as I am slightly older than he). We never considered he shouldn't have been called yet, we just thought it was the process running it's course.

Heartbreakingly, we have since been told that Jack being called for his injection was due to Mendlesham Health Centre sending the vaccination programme details including a disease a close family member did not have, and a telephone number that Jack had told them to change in writing. Shortly after receiving his jab, the reports of Oxford Astrazeneca injections causing deaths were starting to gain attention, but by this time it was too late, Jack had already had the injection. We hope a lesson in accurate medical data keeping will be learnt from this, particularly if in national emergencies medical data is shared with other agencies.

The report details the many horrendous and ultimately catastrophic errors from the moment Jack arrived at West Suffolk Hospital. It appears that at every turn since he checked in something went wrong, and Jack just couldn't catch a break.

It is also profoundly sad that in Jack's last moments, he had to be by himself for the most part due to implemented COVID-19 restrictions (1 family member could see Jack for 1 hour a day), and staff were at times unkind to him. While texting friends during his long wait at West Suffolk Hospital, he was asked numerous times by the receptionist "who even sent you here?" (it was, quite rightly, the 111 service). He was told "it is a coincidence" and said to his friend he was worried "I think I've been left".

Jack spent his whole life being kind, and it is absolutely soul crushing to think that when Jack needed kindness the most, at times this was not found.

We believe part of the reason Jack was not taken seriously at the hospital to begin with was because the “safe and effective” mantra had been repeated so much to the point of it being gospel, that anything that went against this seemed offensive. As though you were somehow wishing COVID-19 on others or you were being deliberately difficult. The symptoms of VITT should have been picked up, and Jack referred to a specialist with life threatening urgency, but instead he was treated as though he was some kind of trouble maker for reacting to the Oxford Astrazeneca COVID-19 jab.

Two staff members at West Suffolk hospital, involved early on in Jack’s care, wrote a short paper on Jack’s case and published it without our knowledge. We note at the end of the report it states “Jack died peacefully in his sleep”. For the purpose of accuracy, as you will read in this report, this was not the case. Jack died following days of agony, with immense internal damage throughout his body, bleeding and clots in his brain, with part of his skull removed.

We hope that even one part of this report does not happen to someone else. It’s unbearable to think that due to these events, Jack has lost his right to a full and happy life at such a young age. We now have to live with the knowledge of these horrors and without Jack.

Jack Last; May 1993 – April 2021

Section 1: Introduction

1.1 On 20 March 2021 Jack Last received an invitation from the local NHS booking system to arrange a COVID-19 vaccination. He booked an online appointment on 25 March. On the morning of 30 March 2021 Jack went to the local vaccination centre at Trinity Park Conference Centre, Ipswich, where he received his vaccination.

1.2 A week later, during the evening of Tuesday 6 April, Jack started to feel unwell with severe headache and disturbed vision. Following a call to NHS 111 telephone health assessment service on 9 April, Jack attended the emergency department at West Suffolk Hospital, and later that day was admitted to the hospital for various tests. Jack remained there until 11 April when following significant deterioration in his health he was transferred to Addenbrooke's Hospital in Cambridge, which is part of Cambridge University Hospitals NHS Foundation Trust (referred to hereafter as Addenbrooke's Hospital).

1.3 Jack remained at Addenbrooke's Hospital until he died on 20 April 2021. At an inquest into his death in December 2022, the coroner recorded a narrative conclusion: that Jack died of a blood clot to the brain caused directly by the administration of the Oxford AstraZeneca COVID-19 vaccine.

1.4 In May 2021 Ipswich and East Suffolk and West Suffolk Clinical Commissioning Groups, working in the Suffolk and North East Essex Integrated Care System (hereafter referred to as Ipswich and East and West Suffolk CCGs) formally commissioned Facere Melius, a healthcare consultancy, to undertake an independent investigation to review the events that led to Jack being called for vaccination, and the care and treatment provided to him from March 2021 until the date of his death on 20 April 2021. This is in line with NHS England's Serious Incident Framework published in March 2015:

> *'Investigations carried out under this framework are conducted for the purposes of learning to prevent recurrence. They are not inquiries into how the person died, as this is a matter for the coroner. Neither are they conducted to hold any individual or organisation to account. Other processes exist for this purpose including criminal or civil proceedings, disciplinary procedures, employment law and systems of service and professional regulation... In circumstances where the actions of other agencies are required then those agencies must be appropriately informed and relevant protocols outside of this framework must be followed' (p.60). (See section 15 - references).*

Section 2: Condolences

2.1 The investigation team would like to express their sincere condolences to Jack's parents, sister, family and friends and thank them for their contribution to the investigation. Jack was a very much-loved son, brother and uncle, and his death has had a devastating effect on all his family.

Section 3: A short profile of Jack Last

3.1 Before his death Jack had been a healthy and physically fit young man of 27, described by his family as an adventurer. He lived in his own home and worked as an agricultural and field engineer, which required him to be strong and fit. He had previously spent six months working in the Antarctic with the British Antarctic Survey, which he had thoroughly enjoyed.

3.2 Most evenings he would enjoy long walks, runs or a bike ride. He took part in many sporting activities with his friends, such as park runs, and tough mud run challenges; he was a competent skier. At 18 he gained his UK private pilot's licence, and regularly flew around East Anglia and beyond. He later obtained his US pilot's licence and did some flying over California.

3.3 Jack was raised and lived most of his life in Suffolk, and had no major health issues.

Section 4: Investigation terms of reference and methodology

4.1 The draft terms of reference were agreed on 10 June 2021 at an initiation meeting between Ipswich and East and West Suffolk Clinical Commissioning Groups and Facere Melius. They were then shared with Jack's family, who added comments and questions of their own that they wanted answers to. The terms of reference were then approved and can be found in appendix one. The Facere Melius team then developed key lines of enquiry in collaboration with the former clinical commissioning group (now the Integrated Care Board), NHS England, and Jack's family. These formed the basis of the investigation and can be found in appendix two.

4.2 The investigation team used a range of qualitative and quantitative techniques and methodology to undertake the investigation. This included a review of all Jack's available healthcare records. In chronological order of events, this process included:

- General Practitioner (GP) records (SystmOne) for Jack and his parents
- NHS 111 call records for 9 April 2021
- West Suffolk NHS Foundation Trust (WSFT) clinical records from 9 to 11 April 2021
- East of England Ambulance Service documentation of transfer from WSFT to Addenbrooke's Hospital on 11 April 2021

- Addenbrooke's Hospital, part of Cambridge University Hospitals NHS Foundation Trust - clinical records from 11 to 20 April 2021
- WSFT patient safety review report, dated 23 July 2021

4.3 The investigation team also reviewed various national and local policies relating to the care and treatment Jack received, as well as national policy and guidance on COVID-19 restrictions that were in place at that time, and the national COVID-19 vaccination programme. A full list of documents received and reviewed is in appendix three.

4.4 The investigation team interviewed or received information from some of the clinical staff who came in contact with Jack while he was an inpatient at West Suffolk Hospital. Meetings also took place with individuals who were in a leadership or strategic position locally:

- East of England Ambulance Service NHS Trust
- East Suffolk Primary Care Network
- GP Plus, provided by Suffolk GP Federation
- Ipswich and East and West Suffolk Clinical Commissioning Groups,
- Mendlesham Medical Group
- NHS 111, provided by Practice Plus Group
- Suffolk and North East Essex Integrated Care Board/Integrated Care System (formerly the Ipswich and East and West Suffolk Clinical Commissioning Groups)
- Vaccine delivery service, provided by Suffolk GP Federation

4.5 In addition, there were many other organisations from whom information and/or clarification conversations were sought to better understand the context and expectations of agencies which had some involvement in aspects of Jack's case, and those with roles and responsibilities in the national COVID-19 vaccination programme:

- Department of Health and Social Care
- NHS England/Improvement (now known as NHS England), national and regional teams
- Addenbrooke's Hospital (part of Cambridge University Hospitals NHS Foundation Trust)
- Primary Care Support England, provided by Capita
- Medicines and Healthcare products Regulatory Agency
- The National Institute for Health and Care Excellence
- National Immunisation Management Service (NIMS), provided by NHS South, Central and West Commissioning Support Unit (CSU)
- British Society for Haematology (BSH)
- The Expert Haematology Panel
- Synnova Business Services

4.6 Because of the COVID-19 restrictions that were in place at the time, most of these meetings

were held online. All references in this investigation and report are listed in section 15.

4.7 The investigation team also met with Jack's family so that they could share their stories of his life, and their recollections and memories of the events that led to Jack receiving the COVID-19 vaccination and how his health deteriorated after he received the vaccine.

4.8 The investigation team would like to thank all of those who met with them and engaged in the process.

4.9 Following the document reviews and interviews, the team verified the accuracy of the chronology of events (see appendix four) to identify key themes. These were fact- checked, analysed and assimilated, wherever possible, and the information triangulated before the report was drafted. The draft report was then peer-reviewed and quality assured by the Facere Melius editorial board, whose members provided additional support, guidance, analysis and expert opinion.

4.10 On completion of the investigation the draft report was shared with the participating organisations and Jack's family as part of the factual accuracy process. The report was then completed ready for publication.

4.11 The identity of the professionals involved in Jack's care and treatment has been anonymised, and their official titles and a random letter of the alphabet have been used instead of their names.

Section 5: Investigation team

5.1 The lead investigator and the person accountable for this report is the managing director of Facere Melius, who was supported by an investigation team consisting of:

- a patient safety specialist, Facere Melius associate
- accident and emergency operational management specialist, Facere Melius associate

5.2 The following provided expert clinical advice to the investigation. They all had experience of treating people with cerebral venous sinus thrombosis, and/or vaccine- induced immune thrombocytopenia and thrombosis. It took considerable time to find clinicians with this specialist experience because of the rarity of these conditions. They all practise in the north west of England, and therefore had no first-hand knowledge of this particular case:

- a consultant haematologist
- a consultant neurologist
- a consultant neuroradiologist
- a consultant intensivist

- a GP adviser

5.3 The editorial board consisted of:

- a director, Facere Melius
- editorial and assurance oversight adviser, Facere Melius associate
- editorial standards adviser, Facere Melius associate

Section 6: Public services

6.1 This complex, multifactorial investigation involved many organisations both locally and nationally. National organisations involved are listed above in section 4. An explanation of their roles and functions is usually explained in the body of the report below, and a brief explanation is given in appendix five.

Local public services

6.2 **Mendlesham Medical Group** is located in Stowmarket, Suffolk and serves a predominantly rural location, with a patient population of around 7,600. It has two surgery locations, where medication prescribed during consultation can be dispensed. In the spring of 2021, there are three general practitioner (GP) partners, two salaried GPs, two nurse practitioners, two practice nurses, practice and operational managers and attached staff who provide general medical services. The role of GPs is to treat all common medical conditions and refer patients to hospitals and other medical services for urgent and specialist treatment. They focus on the whole person's health, combining physical, psychological and social aspects of care. The GP is the main conduit of a person's care.

6.3 Each GP surgery has an electronic record management system in place. This allows health professionals access to secure, electronic information which details a person’s contact with health services across their lifetime. In England these systems are predominantly SystmOne and EMIS Health. The family GP health records were held in SystmOne.

6.4 **West Suffolk NHS Foundation Trust (WSFT)** provides hospital and community health care services to people mainly in the west of Suffolk; it is an associate teaching hospital of the University of Cambridge. West Suffolk Hospital, part of WSFT, is a small district general hospital of around 500 beds in Bury St Edmunds.

6.5 **Addenbrooke’s Hospital, part of Cambridge University Hospitals NHS Foundation Trust** is one of the largest hospital trusts in the United Kingdom. It provides emergency, surgical and medical care for the local people. It is also a regional, national and international (tertiary) centre of excellence for specialist services such as organ transplantation, cancer, neurosciences, paediatrics and genetics.

6.6 **East of England Ambulance Service NHS Trust** provides NHS ambulance services in the counties of Bedfordshire, Cambridgeshire, Essex, Hertfordshire, Norfolk and Suffolk, in the

east of England region, available to around 6.2 million people across an area of 7,500 square miles.

6.7 **Suffolk GP Federation** is a Community Interest Company founded in 2007, comprising 61 independent GP practices in Suffolk, with a total registered population of 540,000. It provides a portfolio of NHS funded services in Suffolk and north east Essex, including urgent care out of hours. They operate from a number of primary care centres in the area, where urgent out of hours referrals from the NHS111 service can attend or receive a home visit. The Suffolk GP Federation also provides emergency department streaming. This offers appointments to people attending the emergency departments at Ipswich or West Suffolk Hospitals who are assessed as having conditions that would be best met by primary care services.

6.8 The Suffolk GP Federation was involved in delivering the COVID-19 vaccination programme. It provided this service to those GP practices locally that did not have the capacity to provide it themselves, and who engaged the Suffolk GP Federation (through Unity Healthcare as the funding stream) to deliver the programme on their behalf.

6.9 **East Suffolk Primary Care Network** is one of two large Primary Care Networks (PCNs) in Suffolk. It consists of thirteen GP practices, one of which is Mendlesham Medical Group. It has more than 150,000 patients, and covers a large area of East Suffolk, from Felixstowe to Eye in the north west. PCNs are groups of GP practices that work closely together to focus on local patient care.

6.10 **NHS Suffolk and North East Essex Integrated Care System and Board.**
Integrated Care Systems (ICSs) were established to enable closer working between health and social care partners for the good of the local communities. The Suffolk and North East Essex Integrated Care Board was legally established and became operational on 1 July 2022. Its responsibilities include allocating the NHS budget and commissioning services for the local population.

Section 7: Context

7.1 On 11 March 2020 the World Health Organisation declared the SARS-CoV-2 virus, which had been officially named COVID-19 (February 2020), as a pandemic. On 23 March 2020 the Prime Minister of the time announced the first national lockdown, ordering people to stay at home. The Coronavirus Act was given Royal Assent on 25 March 2020, and on 26 March lockdown measures legally came into force. Schools, non-essential shops, pubs and restaurants were closed. All workers, including those in the public sector, were required, where possible, to work remotely. These measures continued for some months. They were gradually lifted in the summer of 2020, and replaced with local lockdowns in areas experiencing high rates of infection with COVID-19 (also referred to hereafter as ‘the virus’), deaths from the virus, and high rates of hospitalisation of people infected, many of them in intensive care units.

7.2 Over the coming months the UK government introduced various restrictions through a system of local lockdowns. Two more national lockdowns occurred in November 2020 and in January 2021, during which people were again ordered to stay at home;schools and the hospitality sector closed. These restrictions were gradually lifted throughout 2021 (see appendix six).

7.3 NHS England (NHSE) provides national leadership for the NHS to promote high quality health and care for all, and support NHS organisations to work in partnership to deliver better outcomes for patients and communities. In emergency situations like a pandemic, the national team at NHSE takes command and control of all NHS resources across England in line with the Emergency Preparedness, Resilience and Response Framework, and provides direction for the regional teams on the actions they need to be taking. Having taken advice from senior medical agencies and officers, the government set out (in May 2020) its 'plan to rebuild' the UK in response to the impact of the pandemic on the NHS and society in general. This included five levels of alert (the highest level was 5), as strategies to respond nationally to the developing severity of the impact of COVID-19. From November 2020 to 25 March 2021 NHSE was on alert level 4, reflecting that COVID-19 was in general circulation in the UK. Transmission was high and direct COVID-19 pressure on healthcare services was widespread and substantial or rising.

7.4 The development of vaccines to provide protection against COVID-19 had become an urgent focus of scientists around the world.

Approval and licensing of the vaccines

7.5 The Medicines and Healthcare products Regulatory Agency (MHRA), which is responsible for licensing vaccines for use in the UK, gave approval for the use of the Pfizer-BioNTech (referred to hereafter as Pfizer) vaccine for adults on 2 December 2020. The development of vaccines fell into two broad groups: mRNA (the vaccine type developed by Pfizer), and viral vector vaccines. The Pfizer vaccine had stringent delivery and storage requirements.

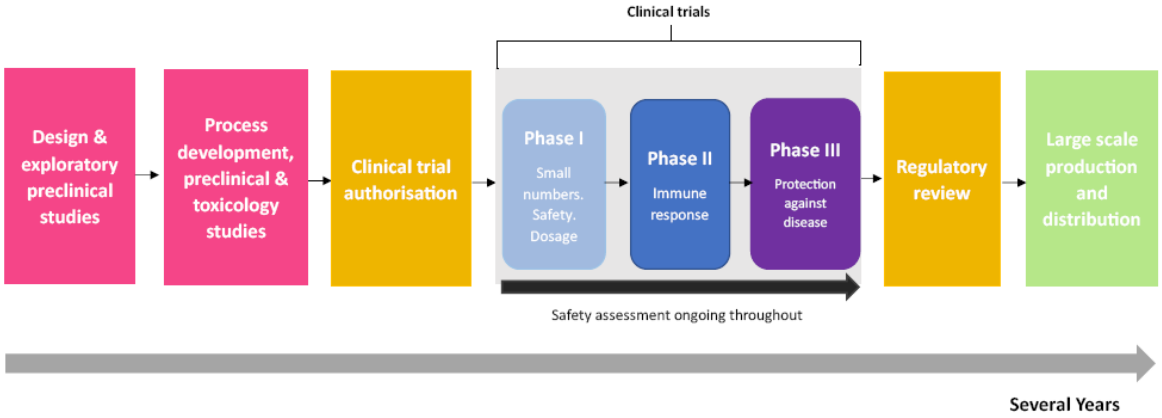
7.6 In the UK a team at Oxford University's Jenner Institute and Oxford Vaccine Group had been developing viral vector vaccines for some years in response to earlier SARS-type viruses. When COVID-19 was identified, the team at Oxford switched their focus to finding a vaccine for this newly emerged virus, adapting the knowledge that they had acquired over these previous years. On 20 December 2020 the UK became the first country to approve the Oxford AstraZeneca COVID-19 vaccine.

7.7 The timetables for developing COVID-19 vaccines were accelerated significantly, because of the efforts of all parties involved. This was achieved without compromising on safety, quality and effectiveness. For example, developers ran trials concurrently, and the government provided funding for manufacturing 'at risk', ahead of vaccines receiving regulatory approval. Meanwhile, the MHRA was constantly reviewing efficacy data, rather

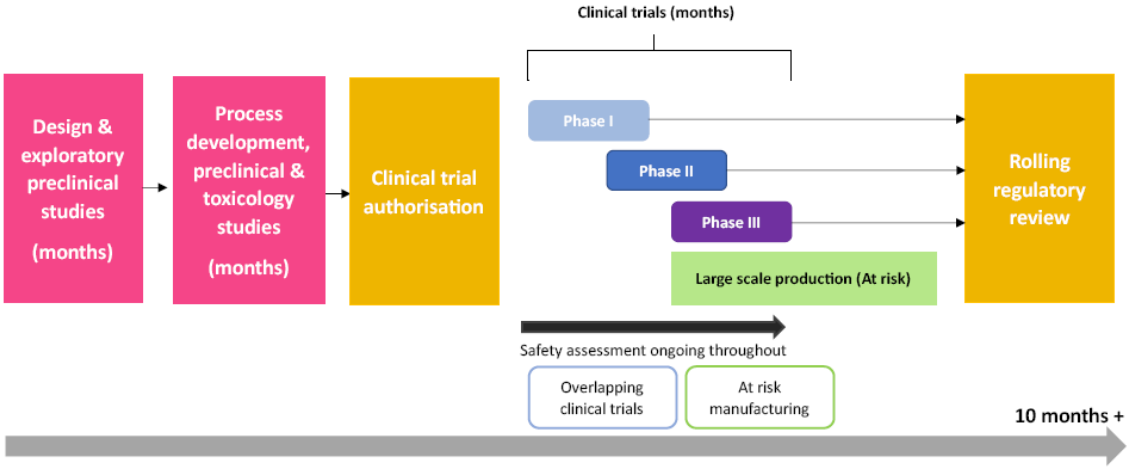
than waiting for all of the data to become available at once. (Gov.uk website: UK COVID-19 vaccines delivery plan, 13 January 2021).

7.8 Traditional vaccine development normally takes several years, as shown below and in appendix seven:

[Department of Health & Social Care (DHSC), UK COVID-19 vaccines delivery plan, updated 11 January 2021]



7.9 The accelerated timetable for developing COVID-19 vaccines was ten months plus:



7.10 The MHRA provided temporary authorisation for emergency supply of the Oxford AstraZeneca COVID-19 vaccine (AstraZeneca vaccine), formerly AZD1222, for the active immunisation of individuals 18 years or older. The decision to approve the Oxford AstraZeneca vaccine was taken under regulation 174 of the Human Medicines Regulations 2012, which enables rapid emergency regulatory approvals to address significant public health issues such as a pandemic. This was not a marketing authorisation. The MHRA decision was based on independent advice from its Commission on Human Medicines, following a rolling review of trial data that included interim analysis of the Phase III programme led by the University of Oxford. This data was also published in the Lancet on 8

December 2020 [AstraZeneca website: 8 December 2020].

7.11 The authorisation recommended two doses administered with an interval of between 4 and 12 weeks. This regime was shown in clinical trials to be generally well tolerated and effective at preventing symptomatic COVID-19, with no severe cases, and no hospitalisations more than 14 days after the second dose. Unlike the Pfizer vaccine, the Oxford AstraZeneca vaccine was able to be stored, transported and handled in normal refrigerated conditions (between two and eight degrees Celsius) for at least six months, and administered within existing healthcare settings [AstraZeneca website 30 December 2020 press release].

7.12 An agreement between Oxford University and Anglo-Swedish biopharmaceutical company AstraZeneca was made to enable manufacture of millions of doses of this vaccine for use in the UK and across the globe. One of the largest manufacturers of the Oxford AstraZeneca vaccine was to be the Serum Institute of India, which was to mass produce it from its facility in the city of Pune. India supplies more than 50 per cent of global vaccines and 25% of NHS generic drugs. It was one part of the supply chain for the Oxford AstraZeneca vaccine, which also included production in parts of the EU as well as in the UK. The Oxford AstraZeneca vaccine (hereafter referred to as the AZ vaccine) was first used in the UK on 4 January 2021, making the UK the first health service in the world to use it.

7.13 The European Medicines Agency (EMA) medicines committee, with the support of EMA's safety committee (pharmacovigilance risk assessment committee) and pandemic task force, had thoroughly assessed the data on the quality, safety and efficacy of the AZ vaccine, and on 29 January 2021 recommended a conditional marketing authorisation be granted by the European Commission (EU). This was to assure EU citizens that the AZ vaccine met EU standards, and put in place the safeguards, controls and obligations to underpin the EU-wide vaccination campaigns. The AZ vaccine was to be used for people over the age of 18 [EMA website, 29 January 2021]. Other European countries began using the AZ vaccine from 8 February 2021. On 25 March 2021 the EMA announced that the AZ vaccine would henceforth be distributed under the name Vaxzevria.

National vaccine programme and delivery

7.14 On 28 November 2020 the government established in the Department of Health and Social Care (the department) a new role of Parliamentary Under Secretary of State for COVID-19 vaccine deployment. On 13 January 2021 the department launched its updated policy paper on the UK COVID-19 vaccine delivery plan. This was the biggest vaccination programme in the history of the NHS. The aim was to have offered the first vaccine dose by 15 February 2021 to everyone in the top four priority groups t hat had been identified by the Joint Committee on Vaccination and Immunisation (JCVI) [UK COVID-19 vaccines delivery plan, 11 January 2021].

7.15 Because of the limited supply of vaccines available in the early part of the vaccination programme, the JCVI produced a priority list of people eligible to receive vaccination against COVID-19, largely based on age, as modelling data showed that the greatest population benefits would come from targeting older people. The vaccines were also prioritised for health and social care workers, and residents and staff in care homes. The rationale was to vaccinate the groups most at risk from serious illness and death, and those at greatest occupational risk of exposure to the COVID-19 infection, before moving to other groups [British Medical Journal (BMJ 2022;378:e070344)]. Both vaccines (Pfizer and AstraZeneca) were in use in the UK in the early stages of the vaccination programme (phase1).

7.16 Shortly after the start of the vaccination programme in the UK, the government decided, based on advice from the JCVI, to prioritise delivery of the first dose of COVID-19 vaccines. Practically, this meant a delay in giving the second dose of the COVID-19 vaccine from 3-4 weeks after the first dose to 12 weeks. The rationale was that more people would receive one dose of vaccine, and thereby gain some protection against the virus.

7.17 The plan was that by the end of January 2021 there would be a network of vaccination sites so that 96% of the population in England would be within ten miles of a vaccination service. These consisted of large-scale vaccination centres, such as football stadiums, and NHS hospitals. There were also local vaccination services set up in sites led by general practice teams working together in already established primary care networks (PCNs) and community pharmacies.

7.18 The JCVI advised that the first priorities for the vaccination programme should be the prevention of mortality and the maintenance of the health and social care systems. As the risk of mortality from COVID-19 had been seen to increase with age, prioritisation was primarily based on age. Nine cohorts were established (see appendix eight), starting with cohort 1: residents in care homes for older adults and their carers, and then in cohorts in descending age order, starting with cohort 2: people 80 years of age and older, and frontline health and social care workers. Cohort 6 was for all individuals aged 16 years to 64 years with underlying health conditions (see appendix nine) which put them at higher risk of serious disease and mortality. The last of this first phase of prioritised groups of the most clinically vulnerable in the UK population was cohort 9: those 50 years of age and older. The JCVI estimated that taken together, these nine cohorts represented around 99% of preventable mortality from COVID-19 [UK COVID-19 vaccines delivery plan, 11 January 2021].

7.19 Throughout phase 1 of the programme the criteria for eligibility to receive a COVID-19 vaccine were occasionally broadened to meet changing circumstances. For example, there were some adults under the age of 30 without underlying health conditions who were

prioritised because they had an increased risk of exposure, and/or to reduce the risk of passing on COVID-19 to vulnerable individuals. This included health and social care workers, unpaid carers, and household contacts of immunosuppressed individuals.

7.20 Phase 2 of the programme began in the spring of 2021. It was again based on cohorts in descending order of age, starting with cohort 10: individuals aged 40 to 49, and ending with cohort 12: individuals aged 18 to 29 years.

7.21 NHS England/Improvement (NHSE/I, later referred to as NHSE) were responsible for implementing the guidance produced by the JCVI and the government. The scale of the challenge they faced was enormous; all parts of the healthcare system were mobilised to ensure that all adults had been given the opportunity to receive a first dose of the vaccine by July 2021, and a second dose by the autumn of that year. They worked in partnership with national, regional and local authorities, the voluntary and community sector, communities, staff and patients to ensure accessible advice and information was available, and that local implementation plans were tailored to support uptake in all communities. As well as trained vaccinators, this unprecedented vaccination programme included a huge number of non-clinical support staff, many of them volunteers or from the armed services, to ensure quick and easy access to the vaccines. This included, for example, administration support, logistics, stewards and first aiders, as well as those who could log, record and manage stocks. [UK COVID-19 vaccines delivery plan, 11 January 2021].

Local Suffolk vaccine delivery arrangements

7.22 The practical delivery of the COVID-19 vaccination programme was complex. Because they were placed in local neighbourhoods, GP practices were well placed to reach diverse communities and avoid inequalities in access. They therefore had an important role to play in the programme, alongside other providers.

7.23 The British Medical Association General Practitioners Committee in England agreed with NHSE that the GP COVID-19 vaccination service was to be commissioned in line with agreed national terms and conditions as an enhanced service (ES), directed by NHSE. The ES was offered to all GP practices, and was not to be capable of amendment by clinical commissioning groups (CCGs). It provided GP practices with sufficient information to begin planning, taking into account that requirements and timescales would be subject to change. This ES related to COVID-19 vaccines only [NHS Enhanced Service Specification, December 2020].

7.24 The Suffolk GP Federation, a community interest company, was founded in 2007 comprising 61 independent GP practices in Suffolk. Its purpose was to strengthen, support and develop primary care services in the county. Because of its unique position it was well placed to take part in delivering the vaccination programme in its local area for those practices that did not

have the capacity to do this themselves. As this was a national emergency and arrangements had to be made very rapidly, the delivery was provided as the result of a collaborative alliance of healthcare organisations in the area under the enhanced service specification referred to above. Funding for the delivery of the vaccination programme came from the government Department for Health and Social Care to NHS England, who then distributed it through the various clinical commission groups (CCGs) onwards to those organisations delivering the programme, including primary care networks, GP practices, and organisations such as the GP Federation.

7.25 The Mendlesham Medical Group (the medical group) had signed up for the NHS Enhanced Service Specification available from the Ipswich and East and West Suffolk Clinical Commissioning Groups. The medical group, in turn, had sub-commissioned the Suffolk GP Federation to deliver the vaccinations on its behalf.

Identification of vaccine-induced immune thrombocytopenia and thrombosis (VITT)

7.26 Between 7-15 March 2021 Austria, Denmark, Norway and Iceland reported links between the AstraZeneca (AZ) vaccine and blood clots occurring in people who had received that vaccine, sometimes resulting in death. The use of the AZ vaccine was paused in those and other European countries.

7.27 On 18 March 2021 the government issued advice from the UK's Medicines and Healthcare products Regulatory Agency (MHRA) in response to the suspensions by some countries of the AZ vaccine over suspected blood clots. The advice from the MHRA, which had followed a rigorous scientific review of the available data, was that the evidence did not suggest that blood clots in veins (venous thromboembolism) are caused by the AZ vaccine. This was confirmed by the government's independent advisory group, the Commission on Human Medicines. It was also confirmed that following a detailed review into cases in the UK of a very rare and specific type of blood clot in the cerebral veins (sinus vein thrombosis) occurring with low platelets (thrombocytopenia) - platelets are small particles in the blood important for blood clotting - a causal link with the AZ vaccine had not been established. The MHRA advice at this time remained that the benefits of the AZ vaccine continued to outweigh any risk and that the public should continue to get their vaccinations [MHRA, 18 March 2021].

7.28 On 29 March 2021, collating what had emerged in its meetings held between 8 and 25 March, the European Medicine Agency (EMA) Pharmacovigilance Risk Assessment Committee considered the latest worldwide data on suspected side effects of the AZ vaccine, one of which was immune thrombocytopenia (low platelet levels that can lead to bruising and bleeding). This included data that had been reported to the European database for side effects (Eudravigilance). As is the case with many population-based analyses, there were some uncertainties. These arose from the lack of uniform data across the EU, possible delays or inaccuracies in reporting side effects, unreported side effects, and limited data

from observational studies. Estimates of risks and benefits were therefore constantly being updated [EMA, 24 March 2021].

7.29 The EMA had also received information from the UK's MHRA on 16 March 2021. (The EMA and MHRA regularly exchanged information in relation to reports received and subsequent assessment of data related to COVID-19 vaccines.) The MHRA review focused on specific UK data on venous thromboembolic events (VTE) occurring more generally, along with an evaluation of cases of thrombocytopenia, with and without VTEs. They noted that VTE occurs naturally in the population and that this background risk is higher in older patients, the cohort in whom the majority of the AZ vaccine had been administered. The MHRA had been closely reviewing reports of VTE following vaccination with COVID-19 vaccines; there was no evidence that it was occurring more than would normally be expected when no vaccination had taken place.

7.30 The MHRA went on to state that the action taken by some EU countries over the previous week to temporarily pause the use of the AZ vaccine had been based mainly on isolated reports of cerebral vein sinus thrombosis (CVST) along with thrombocytopenia and bleeding shortly after vaccination. This form of blood clot can occur naturally in the absence of vaccination and is extremely rare. A causal association with the AZ vaccine had not been established.

7.31 In the UK, four possible cases of this form of blood clot with low platelets had been reported thus far after 11 million doses of the AZ vaccine had been administered. Based on the evidence at the time, given the extremely rare rate of occurrence of these CVST events among the 11 million people vaccinated, and as a link to the AZ vaccine was unproven, the MHRA advised that the benefits of the AZ vaccine in preventing COVID-19, with its associated risk of hospitalisation and death, continued to outweigh the risks of potential side effects.

7.32 The EMA considered all the evidence it had collated by this time (24 March 2021) and came to a similar conclusion as the MHRA – that there was no evidence of a causal relationship between these events and the AZ vaccine [EMA, 24 March 2021].

7.33 The EMA and the UK Joint Committee on Vaccination and Immunisation (JCVI) soon afterwards (7 April 2021), advised that it was preferable that AZ vaccines should not be given to people under 30; an alternative was to be offered if available. This is discussed further in the following section.

> *'There have been reports of an extremely rare adverse event of concurrent thrombosis (blood clots) and thrombocytopenia (low platelet count) following vaccination with the first dose of AstraZeneca ChAdOx1 nCoV-19 vaccine (AZD1222). …. Given the very low numbers of events reported overall, there is currently a high level of uncertainty in estimates of the incidence of this extremely rare adverse event by age group. However, the available data do suggest there may be a trend for*

increasing incidence of this adverse event with decreasing age, with a slightly higher incidence reported in the younger adult age groups….. There are currently no known risk factors for this extremely rare condition, which appears to be an idiosyncratic reaction on first exposure to the AstraZeneca COVID-19 vaccine.' [DHSC, 7 April 2021].

7.34 Possible cases of vaccine-induced immune thrombocytopenia and thrombosis (VITT) were also reported in the following months in patients who had received other types of COVID-19 vaccine, including Janssen (Ad26.COV2.5), Pfizer and Moderna (mRNA-1273), suggesting the condition might be a very rare side effect of the mRNA vaccines also [Chevassut et al, Expert Haematology Panel (EHP), Royal College Physicians (RCP),Royal College of Emergency Medicine (RCEM), Society of Acute Medicine (SAM), Eun-ju Lee et al].

Section 8: Chronology and analysis of key events: 20 March – 20 April 2021

20 – 30 March 2021: invitation for COVID-19 vaccination

8.1 The Suffolk GP Federation, as mentioned above, were providing the vaccine delivery programme in Suffolk for those GP practices that were unable to provide this service. This was a large, mostly rural area. Jack's GP practice, Mendlesham Medical Group, was one of those that had engaged the Suffolk GP Federation to deliver the COVID-19 vaccine to their patients.

8.2 People who had been involved in this local vaccination delivery programme explained to the Facere Melius investigation team that this was a highly complex, rapidly changing and sometimes unpredictable environment. There were times when the local programme needed to adapt its capacity in line with the national vaccine supply chain. Vaccine supply was variable in type (AZ or Pfizer), shelf-life and volume. While the local programme team could request vaccine, at times it was also required to maximise the supply it was sent. On occasion, this may have been more or less than the local population needed when aligned to nationally determined eligibility criteria.

8.3 The local vaccination programme managed all vaccine stock in line with relevant national policies. Centralised stock control enabled available supply to be maximised and reduced wastage. When stock was constrained, either in shelf-life or volume, the local programme worked with all providers to transfer (also known as mutual aid) supply under controlled circumstances to where there was greatest population need. Where supply was plentiful and beyond the need of the local population, every effort was made to maximise its use in line with nationally determined policy. Minimising wastage was an NHS England priority that was supported by the local programme.

8.4 In the week beginning Monday 8 March 2021, the Suffolk GP Federation were notified of the delivery of high-volume, short-life doses of the AstraZeneca (AZ) vaccine. Twenty thousand doses were expected to be delivered to them in the week beginning 15 March. These vaccines had expiry dates of 30 March and 2 April 2021. The AZ vaccine was supplied in packs of ten vials, each vial containing eight to ten doses. These had to be stored at between 2 to 8 degrees Celsius (C) and used within six hours of the vial being opened. Vials could be stored during this period between 2 and 25 degrees C. After this time the vial had to be discarded, even if more doses of vaccine remained in it [Public Health England Green Book ch.14a, 12 February 2021].

8.5 There was a national requirement that wastage of the COVID-19 vaccines (AZ and Pfizer) should be less than 5%. At this stage of the programme, cohorts 1-6 were eligible for vaccination, and there had been good initial uptake for vaccination in the Suffolk and northeast Essex area. At a meeting of the Suffolk and North East Essex COVID-19 vaccination programme board on 11 March, members were advised of risks, including instability in vaccine supply and short notice or late deliveries. The board were also advised that cohort 6 was recognised nationally to be more challenging. It was agreed that everyone across the healthcare system needed to innovate and communicate to encourage take-up of vaccination.

8.6 On 16 March several sites were struggling to use their remaining AZ vaccine stock. This was because of the diminishing number of people in the Suffolk and north east Essex population who were in the eligible vaccine criteria groups, and possibly because of increased hesitancy in the public to take up vaccination invitations after recent media coverage of the suspension in some European countries of the AZ vaccine.

8.7 To address this decline in currently eligible people coming forward for vaccination, the Suffolk GP Federation decided to vaccinate and therefore protect from the COVID-19 virus the maximum number of individuals in the local area. This would also ensure that there was minimal wastage of the remaining short-life AZ vaccine. This was in line with the GP Enhanced Service contract, which stated that vaccination would be permitted to patients outside of a cohort where the GP practice could demonstrate exceptional circumstances. These included that it was clinically appropriate and where resources would otherwise have been wasted.

8.8 Government policy at the time was that no vaccinations were to be administered to people in cohorts in the next phase of the programme without national approval. The Suffolk GP Federation, with support from the Ipswich and East and West Suffolk Clinical Commissioning Groups (CCGs), therefore agreed to expand the existing criteria for vaccine eligibility. It decided to identify and include as eligible for the AZ vaccine people in receipt of carer's allowance and who were caring for individuals already in cohort 6 of the vaccination

programme (all individuals aged 16 years to 64 years with underlying health conditions which put them at higher risk of serious disease and mortality). The purpose of this extension of eligibility was to reduce the risk of infection in immunosuppressed people by vaccinating those most likely to transmit the virus to them.

8.9 Information initially provided by the Department of Work and Pensions (DWP) identified only 400 people in the Suffolk geographical area who would fit this extended eligibility criterion. The Suffolk GP Federation's vaccine delivery service, however, had capacity to deliver 4000 doses of the AZ vaccine.

8.10 On 18 March, following suspensions by some countries of the AZ vaccine after reports of people with suspected blood clots as an adverse reaction to this vaccine earlier in March, the MHRA confirmed that the benefits of this vaccine in preventing COVID-19 far outweighed the risks. People should still go and get their vaccinations when asked to do so [UK Government website, 18 March 2021].

8.11 On 19 March the Suffolk GP Federation sought further urgent advice from the CCGs, as it still had short-life AZ vaccine available, but insufficient patients to vaccinate within current cohorts. The Suffolk GP Federation proposed expanding the criteria to include not just people in receipt of carer's allowance for individuals already in cohort 6, but also those who were living with cohort 6 eligible patients. Once this proposal was agreed by the CCGs, the Suffolk GP Federation instructed Synnova Business Services (Synnova) to identify those people on the GP list who were cohabitating with patients who were included in cohort 6. Synnova found that searches using postcodes and the first line of the address resulted in a low level of accurate matches, so individuals were matched by landline numbers, as this provided a more accurate match.

8.12 Jack's electronic medical record had the same landline number as his parents, one of whose records showed them as meeting the criteria for cohort 6. This parent had received their vaccine on 19 March with the general population of their age group.

8.13 At this time the national guidance from the Joint Committee on Vaccination and Immunisation (JCVI), issued on 6 January 2021, was that cohort 6 in phase one of the vaccination programme would include '*all individuals aged 16 years to 64 years with underlying health issues which put them at higher risk of serious disease and mortality*'. People in this cohort were to be invited for vaccination from 15 February 2021 [DHSC, January 2021].

8.14 Jack received a text message from the Suffolk GP Federation on 20 March 2021, inviting him to book a COVID-19 vaccination. This was followed by a reminder on 25 March. He booked an appointment online the same day for the morning of Tuesday 30 March at the local

COVID-19 vaccination centre at Trinity Park Conference Centre, Ipswich. People attending had to provide proof they had been invited for the vaccine, for example confirmation of their appointment invitation, and they were also checked off a list of those expected to attend on that day. Jack was also asked some screening questions. He received the AstraZeneca (AZ) vaccine (0.5 ml) intramuscularly in his left arm at 08.36. The batch number of the vaccine Jack received was 4120Z003, which had been manufactured at the Serum Institute of India. It had an expiry date of 2 April 2021.

8.15 Jack was given a copy of the patient information leaflets that were usually given to those attending for vaccination (see appendix ten), but these have been updated over time.

8.16 Jack was 27, fit and healthy, and not living with his parents. At this time, he did not meet the expanded local criteria for vaccination: people living with someone who was extremely clinically vulnerable. Jack's family told the Facere Melius investigation team that he presumed that his local area was simply getting ahead of the vaccination programme, and some of his friends had also been invited.

Commentary

C.1 The UK Health Security Agency developed the national data specification of priority individuals for the COVID-19 vaccination programme. It included the relevant clinical terms and business rules to assign people to the appropriate cohort for vaccination. In February 2021 the clinical record system, SystmOne, used by Jack's GP practice, provided a new facility that allowed practices to search for those patients on their lists whose codes indicated that they were clinically vulnerable, and therefore belonged to cohort 6. The Green Book is an online resource from Public Health England that is regularly updated to reflect the latest evidence, guidance and recommendations on all vaccinations. It provided the categories of clinical conditions from which these codes were derived [Green Book, ch.14a, Feb 2021].

C.2 Another system that could be used at this time was QCOVID-19. This was developed as a clinical decision tool to support conversations between clinically trained professionals (and patients) about COVID-19 risk. It helped in estimating a person's risk of being hospitalised or dying as a consequence of catching the virus. It was updated to include factors such as vaccination status and current infection rates. No evidence was provided to the investigation team that this algorithm was applied in Jack's case.

C.3 One of the clinical codes used to identify patients in cohort 6 was for chronic respiratory disease. In this group were '*individuals with a severe lung*

condition, including those with asthma that requires continuous or repeated use of systemic steroids or with previous exacerbations requiring hospital admission, and chronic obstructive pulmonary disease (COPD) including chronic bronchitis and emphysema; bronchiectasis, cystic fibrosis, interstitial lung fibrosis, pneumoconiosis and bronchopulmonary dysplasia (BPD). Poorly controlled asthma is defined as greater than 2 courses of oral corticosteroids in the preceding 24 months OR - on maintenance oral corticosteroids OR greater than 1 hospital admission for asthma in the preceding 24 months' [Green Book, ch.14a, Feb 2021].

C.4 The national cohort 6 algorithm used coded data from the electronic GP records (SystmOne). The algorithm classified one of Jack's parents as being in cohort 6 (described as underlying health issues which put them at higher risk of serious disease and mortality). The classification into cohort 6, was derived from an active clinical code of mild COPD, first recorded in April 2010 at a previous practice. A review of the GP records, by the clinical expert adviser identified that there were no further reviews or active treatment of COPD after 2016, they further concluded there was no firm evidence of COPD and the parents chronic cough was thought to be more asthma related by the respiratory consultant.

C.5 On the 14 February 2020 a nurse made an entry, into Jack's parents record stating 'needs COPD QOF removed-seen in resp dept 2016 – spirometry – asthma. Not on regular ICS [Inhaled Corticosteroids]'. The nurse then excepted from the COPD register as 'Patient unsuitable'. This was a missed opportunity because if a COPD resolved code had been applied at this point, Jack's parent would not have been classified as cohort 6.

C.6 On the 19 May 2021, both the Asthma and COPD diagnosis were "resolved", this means it is no longer considered a current condition, however an historical code as a secondary condition could have been used. The GP surgery, reasonably held the view that they did not want to remove the asthma code as they felt having this problem on the parent's GP record would highlight important information to any future clinician. Cohort 6 does include some provision for a diagnosis of asthma, but Jack's parent did not meet the either of the asthma thresholds set out in paragraph C3.

C.7 The Quality Outcomes Framework (QOF – see appendix eleven) consists of a number of clinical indicators, which are updated annually. Disease registers enable general practices to identify patients with chronic conditions such as COPD, and support practices in determining which clinical indicators and

targets apply to their patient population. In February 2020 there was a request to except Jack's parent from the QOF indicator, this was processed as 'patient unsuitable'. In May 2021 a clinical code was applied to Jack's parent's record that marked COPD as resolved on their patient record, if this code had been applied in February 2020, Jack's parent would not have appeared in cohort 6. There appeared to be no significant change to Jack's parent's condition between February 2020 and May 2021. A subsequent query for cohort 6 run after the resolved code had been applied confirmed that Jack's parent did not appear in the search results.

C.8 Facere Melius' clinical expert adviser reviewed Jack's parent's medical records, and concluded that it was erroneous to code the parent's clinical condition as COPD. Therefore, Jack should not have been invited for vaccination, as he did not meet the expanded criteria of eligibility that included people cohabiting with those in cohort 6.

C.9 Jack was living with his parents until he moved into his own home in 2018. His GP practice gave him a standard form (NHS GMSA Amendment form) on which to update his contact details. This form has no facility for ensuring the removal from his electronic patient records of any pre-existing telephone numbers. His parents' landline number was therefore still present in his records.

C.10 The search parameter used by the CCG, to identify household cohabitees of eligible cohort 6 individuals, was matching landline telephone numbers. Because Jack's updated record, still contained his parents home landline telephone number, he was identified as also eligible for a vaccine. Contacting these newly eligible individuals was done where possible by text message to a mobile phone number, as this was most likely to produce the most rapid response. This is why Jack received the text message inviting him for vaccination.

C.11 On 31 March 2021, the day after Jack had his vaccination, NHS England published updated guidance from the JCVI that adult household contacts of adults (over 16 years of age) with severe immunosuppression should be offered COVID-19 vaccination alongside priority cohort 6. These household contacts were to be sent a template letter from their GP practice letting them know they were eligible for vaccination. They were to use that GP letter, along with their own documentary evidence of their address (such as a recent utility bill), which had to match that of the cohort 6 person with whom they were living. These documents were to be provided at their

vaccination appointment as proof of their eligibility. The definition of eligible 'household contact' was very clear: *'individuals who expect to share living accommodation on most days…and therefore for whom continuing close contact is unavoidable'* [Green Book ch.19 'Influenza'].

C.12 At the time Jack had his vaccination, these proof of address document checks were not required. If they had been, he would have been seen to be ineligible. Jack would, therefore, have been included in the later cohorts 10-12, by which time there was further advice about the advisability of avoiding the use of the AZ vaccine for individuals under 30.

6– 9 April 2021: First indication that Jack had an adverse reaction to the AstraZeneca vaccine

8.17 On Tuesday 6 April, a week after receiving the AZ vaccine, Jack began experiencing severe headaches, sometimes with vomiting and visual disturbances. He treated these with paracetamol and aspirin. He was unable to work and spent most of Tuesday to Thursday that week in bed sleeping. The symptoms gradually improved, but he still had a dull pain on both sides of his forehead and pain behind his eyes. By Friday 9 April, he still had a slight headache, but was able to go for a two-mile walk.

8.18 On 7 April the government published updated guidance from the MHRA issued on 18 March, and reiterated that the benefits of vaccine against COVID-19 continued to outweigh any risks, and the public should continue to get their vaccine when invited to do so. There had been reports of extremely rare adverse events of concurrent thrombosis (blood clots) and thrombocytopenia (low platelet count) following vaccination with the first dose of the AZ vaccine. This had been reported in less than one in a million people vaccinated at that point in the UK, and can also occur naturally. A causal association with the AZ vaccine had not been established.

8.19 On the same day, NHS England (NHSE) published a 'Dear colleague' letter [approval reference C1245] to all leaders in NHS trusts, CCGs, primary care networks, GP practices, community pharmacies, and integrated care systems. This was copied to NHS medical directors, chief nurses, and leaders of other healthcare and local government organisations. The letter included a statement from the JCVI.

8.20 Updated NHSE guidance was that the benefits of prompt vaccination with the AZ vaccine far outweighed the risk of adverse events for individuals over 30 years of age, and those with underlying health conditions. The current advice then given was that it was preferable that people under the age of 30 and without any underlying health conditions, or who were household contacts of immunosuppressed individuals, should be offered an alternative to

the AZ vaccine, if available. [Gov.uk website 7 April 2021].

8.21 On 9 April Jack's family, having heard of this updated guidance on the news, and the possibility of adverse reactions to the AZ vaccine in under 30s, encouraged him to call NHS 111. He did so in the early afternoon that day. Although his symptoms of severe headaches were improving, they still thought it advisable to seek professional advice.

Commentary

C.13 During this period the number of people across the country who were contracting the virus was increasing rapidly. The government was therefore very determined to ensure that the vaccination programme was being rolled out as quickly and effectively as possible. Meanwhile, more was being learnt about the virus, new variants were being identified, and the efficacy of available vaccines was having to be constantly monitored. The NHS and those delivering the vaccination programme were consequently having to constantly review and revise their plans to ensure they were in line with the latest guidance, and that this was being communicated clearly to front line staff.

Jack's first contact with health services from 9 April 2021

8.22 When Jack spoke to the NHS 111 call handler (at 13:40 on 9 April), he told them that he had received the AstraZeneca (AZ) vaccine the previous week and explained his symptoms over the previous few days: severe headache, disturbed vision, and eye pain. He explained that although these had since improved and he was feeling better, he still had some mild eye pain and a slight headache. Following this initial assessment, he was told that a clinical adviser would call him back within the hour. This call was duly taken by Jack at 14:20.

8.23 The clinical adviser carried out a detailed clinical assessment of Jack's symptoms and other relevant factors, including some relating to the COVID-19 vaccination he had recently received. The call took over ten minutes, and towards the end the clinical adviser urged him to go as soon as possible to his local emergency department (ED), West Suffolk NHS Foundation Trust, Bury St Edmunds. Although Jack felt initially that this might be an over-reaction, the clinical adviser was able to convince him that this was his best option. The clinical adviser said Jack should aim to attend within the next hour, and they would send the ED a referral. Jack was to tell the staff when he arrived that he had been referred there by NHS 111. Jack's mother drove him to the ED. COVID-19 restrictions in place at the time required that patients attending emergency departments could only be accompanied in exceptional circumstances; she therefore had to wait for him in the car park and he entered the ED alone.

8.24 The NHS 111 call summary data was sent to the West Suffolk hospital ED electronically, where his registration on to their FirstNet (the hospital's electronic patient record) system was recorded at 15:13. The call summary highlighted in capital letters that Jack had received the AZ vaccine a week earlier – flagging up that this was a possible reaction case.

8.25 Jack had a preliminary assessment (triage) by a clinician to determine the urgency of his needs and the nature of the treatment he needed. He was then given an appointment to see the on-site GP to be assessed on the cause of his headache symptoms. The GP saw him at 16:33 and concluded that it was not a migraine headache, but that he should be referred to the emergency department for a neurological review and a scan for cerebral venous sinus thrombosis (CVST), which occurs when a blood clot forms in the brain's venous sinuses. This prevents blood from draining out of the brain. As a result, blood cells may break and leak blood into the brain tissues, forming a haemorrhage (Johns Hopkins Medicine website).

8.26 Jack was then referred to the ambulatory emergency care unit (AEC), which provides a quick assessment for patients with acute medical illness, but who might not need hospital admission. Also based in this unit is an acute assessment unit (AAU), which has a specialist area for rapid assessment, diagnostic tests, and observations.

8.27 While he was in the AEC, Jack was examined by Dr A who arranged for him to have a full blood count. Blood test results showed some abnormal levels. His C-reactive protein levels (14) were mildly raised, but he had low platelets, very high D-dimer (above the range expected for a venous thromboembolism) and low fibrinogen. These indicators had been identified as warning signs (red flags) for cerebral venous sinus thrombosis and/or vaccine-induced immune thrombocytopenia and thrombosis (VITT).

	Normal range	Jack's results (9 April 2021)
Platelets	150 – 400 x 10*9/L	90 x 10*9/L (low)
D-dimer	<500 ng/ml	34,071 ng/ml (high)

Nb: 1 Nanogram per milliliter [ng/ml] = 1 Microgram per liter [mcg/l]

8.28 He was seen by the on-call consultant Dr B around 18:00. Having reviewed Jack's history, clinically examined him, and viewed his blood test results, Dr B's first impression was that Jack was experiencing a post-vaccine headache/migraine that was improving but not resolved. As he wanted, however, to rule out cerebral venous sinus thrombosis (CVST), he arranged for Jack to have a computerised tomography venogram (CTV) scan of his brain. This would provide a more accurate and detailed depiction of the cerebral venous system (the system of veins in the brain) than a plain head (CT) scan. CTV scans combine a series of X-ray images taken from different angles around the body. Computer processing then creates cross-sectional images of the bones, blood vessels and soft tissues inside the body. This plan was discussed with Jack, who gave his verbal consent to proceed with the scan.

Commentary

C.14 It is the opinion of the Facere Melius expert intensivist who provided advice for this investigation that a discussion with a haematologist should have taken place at this point. The GP who had first assessed Jack had already concluded that Jack's condition did not result from a migraine headache. Despite Jack's grossly abnormal blood test results (deranged coagulation), the on-call consultant showed little clinical suspicion about the potential underlying cause of Jack's condition.

C.15 With such a serious haematological abnormality, and with other potentially serious diagnoses associated with such results, haematological specialist input was required. There was a lack of urgency in getting a CT venogram at a specialist centre or starting empirical treatment. Medical teams had a general awareness at this time of the EHP guidance on the need to be vigilant about possible VITT-CVST cases post-vaccination. In the development of this guidance, the EHP had collaborated with neurological and intensive care societies to ensure that patients were referred immediately to centres of neurological expertise to ensure correct management. [Chevassut et al, Expert Haematology panel (EHP), Royal College of Physicians (RCP), Royal College of Emergency Medicine (RCEM), Society of Acute Medicine (SAM), Eun-ju Lee et al].

8.29 It was not possible to perform the CTV scan as the radiographer in attendance did not have the technical expertise to perform such a scan. Dr B, the on-call consultant, therefore advised that Jack should have a plain head CT scan (which was performed that evening). A plain head scan is used as a means of detecting serious abnormalities. Jack was then to be moved to the acute assessment unit for observation overnight.

8.30 Out of hours reporting on scans at West Suffolk Hospital is provided by 4Ways Healthcare Ltd, an imaging outsourcing company that provides remote reporting services for a large number of NHS trusts and private healthcare organisations. The radiologist reported on the CT scan that evening, indicating that there were no acute abnormalities in Jack's brain. This was later found to be inaccurate. As a CT venogram was not available, the plan was for it to take place in the morning. Jack was then transferred to a bed on the acute assessment unit (AAU).

8.31 The incorrect reporting of the CT scan was identified on the morning of 10 April when Dr B discussed the case with Dr C, the on-call consultant radiologist. Dr C reviewed the overnight CT scan, and concluded that there was some high-density thrombus (blot clot) visible on the

scan.

Commentary

C.16 As noted above, the government published advice on 7 April 2021 that individuals under 30 should be offered an alternative to the AZ vaccine, if it was available, because of the recently discovered possibility of rare adverse reactions. These included vaccine-induced immune thrombocytopenia and thrombosis (VITT) – a very rare condition where a patient has low platelet counts, and can experience blood clots in veins and arteries (thrombosis), for example in the cerebral venous sinuses (the large veins or channels that drain blood from the brain). In such cases it is then called CVST. It can occur between 5 and 28 days after a patient has received the AZ vaccine. By the time Jack was being assessed at West Suffolk Hospital, therefore, this possibility was known and was taken into account.

C.17 The emergence of VITT as an adverse event complicating the COVID-19 vaccination programme prompted urgent action from the haematology community, resulting in the rapid formation on 22 March 2021 of an Expert Haematology Panel (EHP) to advise on the investigation and management of suspected cases, and to produce the first guidance on the emergence of VITT. Importantly, the EHP produced constantly updated guidance hosted on the British Society for Haematology website. This was based on available evidence and expert opinion in what was a rapidly evolving situation. [Chevassut et al, Expert Haematology Panel (EHP), Royal College Physicians (RCP),Royal College of Emergency Medicine (RCEM), Society of Acute Medicine (SAM), Eun-ju Lee et al].

C.18 The EHP published updated guidance on the management of VITT on 7 April 2021. This pointed out that these were pragmatic guidelines based on experience of managing alternative similar conditions, and the theoretical risks and benefits of intervention. As more evidence emerged, recommendations were expected to change (and subsequent updates were published in the weeks that followed as more evidence became available). The advice was that patient management should be individualised according to specific circumstances. The guidance also noted that VITT/CVST was a rare condition affecting patients of all ages and both genders. Clinicians were advised to be alert to this condition.

C.19 From the account given above of Jack's treatment from first admission to West Suffolk Hospital, the medical teams involved with his care showed

awareness of the EHP updated guidance.

C.20 The EHP updated guidance set out advice for a number of scenarios, from 'definite' to 'unlikely' cases of VITT/CVST. Each one was accompanied by a clinical management plan. Jack's blood test results were so abnormal that he could have been categorised as a probable case on the basis of his initial results even before it was possible to confirm thrombosis. He had a low platelet count and low fibrinogen, and his D-dimer score was extremely high at 34,071 ng/ml. The EHP updated guidance indicated that a probable case would be suspected in a person with a score greater than 4000, while a definite case is described as 'very raised' levels, with low platelet count and 'may develop low fibrinogen'. Jack's results should therefore have been identified as red flags for a diagnosis of VITT/CVST [EHP guidance April 2021- see appendix twelve].

C.21 The EHP updated guidance clearly shows haematologists being asked to be vigilant for possible and probable cases from 24 March 2021. The consultant who reviewed Jack on his initial presentation did not specifically address his thrombocytopenia or very high D-dimer scores. If these clear indicators of possible CVST/VITT, given Jack's status as a fit young adult who had recently received the AZ vaccine, had been discussed with a haematologist, the latter would have been aware of the current speciality guidance. It is noted that it would have been possible but less likely for an acute physician to have been aware of or had access to the EHP updated guidance at the time. Jack would have fitted the criteria to treat pending formal diagnosis. Instead, treatment did not begin until after the CT venogram confirmed the CVST. This was therefore a missed opportunity to start Jack on the only treatment which might have had the potential to modify progression of the disease.

C.22 It is the opinion of the Facere Melius clinical experts who provided advice for this investigation that even if a diagnosis of VITT had not been confirmed, the blood parameters (high D-dimer and low platelets) in Jack's results were so abnormal that these should have prompted a discussion with a haematologist at that stage. If this had happened, and the EHP updated guidance on management of a probable case had been followed, it is likely that intravenous immunoglobulin, and at least prophylactic non-heparin-based anticoagulation (preventative blood thinner) such as argatroban, would have been given, until the CT venogram could be performed to confirm the diagnosis. The abnormal bloods were first recorded at 18:15 on the 9th April. The first recording of anticoagulant medication prescribed by the haematologist was 16:18 on the 10th April, a delay of 22 hours.

C.23 It would also have been advisable to send Jack straight away to another hospital or centre that could provide the CT venogram he needed, rather than waiting until the next day. This would have enabled the clinical team to establish whether he did indeed have VITT. This is such a serious condition that prompt diagnosis provided by the CT venogram would have been possible and treatment started more rapidly. However, given the pressure that acute trusts were under at this time, it is unlikely that an inter-hospital transfer for imaging alone would have taken place any more rapidly than the scan that did take place at West Suffolk Hospital.

C.24 The blood clot in the right venous drainage channel of Jack's brain was visible on the original CT head scan, but was not reported by the radiologist (from 4Ways). This was another missed opportunity to start treating the blood clot straight away, but this would not have provided a definitive diagnosis of CVST. An indication of probable CVST-VITT was not identified until the CT venogram was performed the following day. Dr B, the on-call consultant, said at Jack's inquest (held on 12 and 13 December 2022) that he would have treated Jack for VITT that night if he had been given an accurate report from the CT scan. Guidance (v1.3) from the Expert Haematology Panel (EHP) available online on 8 April 2021) suggested that for probable cases (D-dimers higher than 4000 mcg/L), clinicians should *'treat first while awaiting confirmatory diagnosis'*. This advice remained unchanged from v0.7 of the EHP updated guidance available online on 31 March 2021 [EHP April 2021].

Jack's inpatient stay at West Suffolk NHS Foundation Trust, 10 – 11 April 2021

8.32 Jack had his CT venogram scan on the morning of Saturday 10 April. The report on this scan stated that 'appearances are in keeping with significant cerebral venous sinus thrombosis' (CVST). He was reviewed by Dr D, the medical registrar, who contacted Dr E (consultant haematologist) for their opinion. Dr E's impression was that Jack was presenting with VITT (vaccine-induced immune thrombocytopenia and thrombosis), from which CVST can result. It is noted that an incorrect vaccination date of 6 April was used in correspondence at WSH and passed to Addenbrooks. This error is not considered to have had an impact on Jack's care and treatment.

8.33 A care plan was put in place which included non-heparin-based anticoagulant treatment (dabigatran) in tablet form to thin the blood, and an intravenous infusion of immunoglobulin. Further blood tests were to be taken twice daily to inform future care plans. A blood sample was to be sent immediately to the laboratory at UK Health Security Agency Colindale (Colindale) for PF4 (platelet factor) antibody testing. That would provide confirmation of a clinical condition, heparin-induced thrombocytopenia (HIT), which closely

resembles VITT. Colindale could not carry out such tests over the weekend, but received the sample and would process it on Monday.

8.34 In addition, he was to have frequent neurological observations. His case was also discussed with Dr F, a neurologist from Addenbrooke's Hospital, part of the Cambridge University Hospitals NHS Foundation Trust, who advised that the care plan that was in place was to be continued.

8.35 At this time Jack's Glasgow Coma Score, which assesses a patient's level of consciousness, was the maximum, 15, indicating a fully conscious person.

8.36 A member of Jack's medical team sent a report to the Medicines Healthcare products Regulatory Agency (MHRA) yellow card system. This is where suspected adverse side effects to medicines, vaccines, and medical devices can be reported either by an individual or their treating clinician.

8.37 That afternoon the registrar, Dr D, updated Jack's parents on the findings of the CT venogram scan, and the management plan that had been agreed by the team treating him. Dr D explained that CVST is a serious condition but Jack had been started on the appropriate treatment plan, and they were hopeful that he would recover.

8.38 Jack's condition continued to be stable at this time and he was still being cared for in the AAU. His nursing staff had been advised to monitor him closely for any signs of deterioration. His case had been discussed with the intensive therapy unit (ITU) clinical team, and it had been agreed that Jack would be transferred there if his condition deteriorated.

8.39 He was added to the outreach nursing team caseload; these are ITU nurses who assess acutely ill or deteriorating patients on wards to advise the patient's team on monitoring investigations and management plans. The aim of involving such teams is to stabilise and improve patients at ward level, and so avoid the need for admission to a critical care unit.

8.40 The AAU sister contacted the outreach team for assistance in transferring Jack to the stroke unit (ward G8). This was because of the high level of neurological observations and regular blood tests that he needed.

8.41 At 06:00 on Sunday 11 April, Jack was reviewed by Dr G, as he had developed new neurological symptoms: increased severe headache, nausea and vomiting, and pins and needles in his left hand. These changes were discussed with the neurology team at Addenbrooke's Hospital, who recommended another CT head scan. The results of this scan showed a right parietal lobe acute parenchymal haemorrhage (a bleed on the brain), and neurosurgical evaluation and management was advised.

8.42 A number of clinical actions then followed, including further haematologist advice from Addenbrooke's Hospital. Urgent blood tests were also taken, and the anticoagulant (dabigatran) was stopped. Jack was then given idarucizumab, an antibody that reverses the anticoagulant effects of the dabigatran. He was given steroids, and the intravenous immunoglobulin continued to be administered.

8.43 The outreach nursing team were in attendance; they had made the ITU team aware of the situation in case of any further deterioration in Jack's condition, such as his Glasgow Coma Score (which at this point was still normal at 15), and the possibility of his being transferred to Addenbrooke's Hospital.

8.44 That morning Jack's parents were phoned by the hospital at Jack's request to give them an update on Jack's condition: that he had had a bleed on his brain. His parents were told that he might have to be transferred to Addenbrooke's Hospital at some point that day, because this had the specialist and expert facilities Jack needed. They were also told that he was awake and alert, but the combination of the blood clot and the bleeding made his ongoing management challenging, and that he was in a serious situation. They discussed the possibility of visiting him, given the restrictions still in place because of COVID-19, and it was agreed that Jack's parents could visit their son.

8.45 It was ultimately decided by Jack's medical team that he needed an urgent transfer to Addenbrooke's Hospital, as his condition was a very rare, new phenomenon that needed expert help. Jack was alert and mobile, needing painkillers for a headache he rated as five out of 10 in severity. His Glasgow Coma Score remained normal at 15.

Commentary

C.25 The Facere Melius clinical expert's view was that haemorrhage frequently occurs in patients with CVST. It is unknown whether patients who have VITT-CVST and are given blood thinners (anticoagulants) are at higher risk of a cerebral haemorrhage as a complication of CVST. Guidance from the Expert Haematology Panel issued on 7 April 2021 on management of VITT/suspected CVST cases recommended that antithrombotic agents (including blood thinners like dabigatran) should be given even where cerebral haemorrhage has occurred. Jack's treatment at this point was therefore in line with this guidance. This guidance also advised that bleeding and thrombotic risk needed to be carefully balanced, and lower doses might be appropriate while platelet count was low.

C.26 Most cases of VITT-CVST occur after the first dose of the AZ vaccine, although

it can occur after the second dose of a two-dose vaccine, but this is rarer. Clotting that blocks blood vessels like veins and arteries (known as thrombosis) is the commonest feature in cases of VITT. Both venous and arterial thromboses can occur. Cerebral venous sinus thrombosis (CVST) may present as bleeding in the brain (intracranial haemorrhage). The brain is perhaps the commonest site of thrombosis, but this can occur in many (sometimes unexpected) places in the body. Importantly, if an individual has symptoms that strongly suggest VITT, the lack of detection of thrombi initially is not a reason to withhold treatment for VITT.

C.27 The AZ vaccine is now known to be associated with immune thrombosis that is similar to heparin-induced thrombocytopenia (HIT), but in patients who have not had exposure to heparin. That is why Jack was given dabigatran, a non-heparin-based anticoagulant. People with this condition have antibodies targeted against platelet factor 4 (PF4) that seem to induce massive platelet activation, reducing the platelet count and causing thrombosis (referred to as VITT).

C.28 A sample of Jack's blood was sent to the Bacteriology Reference Department at the UK Health Security Agency (UKHSA) laboratory at Colindale in London for testing for this antibody response, in line with guidance from the Expert Haematology Panel (7 April 2021) This Colindale facility is a national and international service to enable the UKHSA reference and specialist laboratories to continue to provide critical support and learning in response to the COVID-19 pandemic.

Admission to Addenbrooke's Hospital: Sunday 11 April - Tuesday 20 April 2021, when Jack died

8.46 Jack was admitted to Addenbrooke's Hospital at midday on Sunday 11 April. On his arrival, Jack was reviewed by neurology and haematology clinicians. His father was able to sit with him for a while initially. Because of the COVID-19 restrictions, however, he eventually had to leave the ward.

8.47 That afternoon the consultant haematologist decided to start a critically ill patient infusion regime, with argatroban. This is a different anticoagulant from dabigatran, which Jack had been given previously. It is used to prevent and decrease the clotting ability of the blood, and to help prevent harmful clots from forming in the blood vessels.

8.48 Jack and his parents were extremely anxious about this decision, because of the reaction after his dabigatran infusion at West Suffolk Hospital. The clinical team at Addenbrooke's

Hospital explained that Jack's bleed was not caused by the treatment he had been given, but by the back pressure from the blood clot. After multiple blood tests and careful consideration and further discussion with Jack and his parents, the rapid response team transferred Jack to a ward that could better support his needs. It was agreed Jack required a bed on the neurosciences critical care unit (NCCU), where he arrived at 00:34 on Monday 12 April.

8.49 On arrival at the NCCU, a mental health assessment was completed, an arterial line was inserted, and argatroban infusion commenced. A mental health assessment was conducted to establish if Jack had capacity to understand information to enable him to consent to treatment. The assessment concluded that because of his fluctuating Glasgow Coma Score and the intracranial haemorrhage, he did not have capacity to make this decision. An arterial line was inserted at 01:38. This was to monitor his arterial blood pressure and obtain arterial blood gases and specimens. At 01:58 Jack was started on an infusion of argatroban which needed close monitoring every 15 minutes for neurological deterioration, and frequent bloods tests.

8.50 The Mental Capacity Act 2005 (MCA) is designed to protect and empower those who may lack mental capacity to make their own decisions about their care and treatment. Examples of people who may lack capacity include those with a brain injury. A two-stage test is used to assess capacity under the MCA:

- The functional test to assess whether the person can understand, retain, weigh and communicate information relevant to the particular decision.
- If the person cannot make the decision, the diagnostic test to consider whether this is because they have an impairment of, or disturbance in the functioning of the mind or brain.

8.51 If the person lacks capacity to make a decision and the decision needs to be made for them, the MCA states that it must be made in their best interests. A mental capacity assessment of Jack's capacity to consent to treatment was made at regular intervals, at least 18 times over the following days, to inform critical decisions about his treatment and care. Jack's family have no recollection of his deterioration in mental capacity being discussed with them (see appendix thirteen).

8.52 An observation check on Jack by a nurse at 03:30 on 12 April found that his left arm was in an involuntary rigid position (posturing), which can be an indication of brain injury, or a stroke. A neurology assessment identified severe left-sided weakness, and that his pupils were of unequal sizes. This can be indicative of dangerous brain damage. His Glasgow Coma Score had also dropped to 5, which is considered severe.

8.53 Jack was urgently medically reviewed, and he had another CT head scan. The argatroban infusion was briefly and temporarily paused at 05:15 on 12 April, then promptly restarted

after multi-disciplinary team discussions about Jack's deteriorating clinical condition. The results of the blood tests at Colindale were received and showed positive presence of antibodies to platelet factor 4 (PF4), indicating the likelihood of a vaccine-induced adverse reaction after Jack's AZ vaccination.

Commentary

C.29 The neurology team at Addenbrooke's Hospital were keen to restart anticoagulation treatment for Jack. All anticoagulation brings some risk of bleeding, and this has to be weighed against the risk of clot formation and propagation. They were reluctant to recommend dabigatran because of how Jack had reacted to it at West Suffolk Hospital. They discussed Jack's case with the haematology team, considering their options, and concluded that the safest was argatroban infusion. This would need close monitoring but would allow for dose titration – adjusting the doses administered to achieve the best clinical reaction, with least risk.

8.54 A further CT scan indicated that Jack's condition had deteriorated seriously when compared with the previous scan. There was slightly more extensive bleeding in his brain, and a significant increase in brain swelling (vasogenic oedema). This had resulted in increased displacement of brain tissue across the centre line of the brain (midline shift). It was decided that the neurosurgery team was to be contacted, and Jack's medical team was to update his parents.

8.55 A member of Jack's nursing team rang his parents in the morning of 12 April, making them aware of the overnight events and the CT scan, which confirmed that his bleed had worsened. His parents were understandably very worried about him. They were advised that he remained on the anticoagulant medication: the aim was to dissolve the clot. There were no plans at that point for surgery, but Jack was being assessed regularly by the neurosurgeons. He was being given one-to-one care, and his parents would be called again following the doctors' rounds. This was done at 13:00.

8.56 At this time Jack's parents were still on-site, but because of the COVID-19 restrictions only one person could visit a patient for an hour each day. This had to be the same person each visit. Arrangements were made for one of his parents to visit that afternoon at about 14:00.

8.57 As the day progressed (12 April), Jack's neurological status continued to worsen, confirmed by an electroencephalogram. This is a test which measures the electrical activity of the brain. Jack's consciousness level was fluctuating (his Glasgow Coma Score was falling) and the pressure in his skull (intracranial) was rising. The consequence of raised intracranial pressure would be to further compromise blood flow and thus oxygen delivery to Jack's

brain, with the consequent risk of permanent brain damage or death. His medical team then decided to sedate and ventilate him to enable closer control of factors impacting on intracranial pressure, to protect his airway and to optimise the care being provided. Jack was now in a critical condition. A breathing tube was inserted (intubation) at 16:56 to enable mechanical ventilation, along with a central venous catheter. This ensures reliable access to a large vein for monitoring of central venous pressure and delivery of drugs directly into the large central veins. A nasogastric tube and other standard critical care interventions were made to fully support his continuing care needs.

8.58 Jack's parents were contacted by telephone later that afternoon by Dr H, who explained that because of Jack's fluctuating consciousness, a decision had been made to put him to sleep with medication and provide mechanical breathing support. They were then able to come and visit him again.

8.59 At 17:41 a consultant from the neurosciences critical care unit (NCCU) recorded that the decision was made to perform an emergency decompressive craniotomy. This is a procedure where part of the skull is removed to allow a swollen brain room to expand and thus mitigate the increase in pressure. Anticoagulation was paused at this time. A member of the neurosurgery team (Dr I) explained to Jack's parents the reason for the surgery: that it was a life- saving intervention, but the prognosis remained guarded. The main expected complication would be uncontrollable intracranial bleeding. The surgery was performed that evening.

8.60 His parents were told that they could not wait on the NCCU while the surgery took place or visit that evening. If anything changed, they would be invited to visit. They were in on-site accommodation and told the staff that they wanted to be called at any hour with news of any change.

8.61 On Tuesday 13 April, at 01:50 a post-operative CT head scan was performed; this was used for surgical guidance for the insertion of a left-sided extraventricular drain (EVD) later that day. An EVD is a temporary system that allows drainage of cerebrospinal fluid (CSF) and the measurement and monitoring of intracranial pressure. The CSF was noted to be under very high pressure and blood stained; this can be a sign of brain haemorrhage and other serious conditions. Neither of Jack's pupils were reacting to stimulus.

8.62 Jack's parents were updated by telephone that morning and told that the surgery had gone well. There was still concern about brain pressure, and he was still in a critical condition. His parents had a meeting with his medical team at 13:00, at which their questions about the treatment plan and Jack's condition were discussed and responded to. They were then both able to visit him for a short time.

8.63 Jack's parents were still staying on-site overnight, and they asked to be informed of any changes. A letter was left for them to help them gain access to the hospital, as they had been having problems getting past security.

8.64 At 10:12 on Wednesday 14 April, discussions between the neurosurgery and haematology teams resulted in a decision to administer an anticoagulant, fondaparinux, to be given as a prophylactic dose (2.5 mg) the following day, 15 April. During this time Jack was being treated on the NCCU and was being closely observed. Jack's parents were both able to visit him that day, and they were given an update on Jack's condition by a clinician. A member of the nursing staff explained that future visits would have to be restricted to one person again (in line with COVID-19 restrictions on visiting at that time). They phoned later for another update and told the treatment team which of them would be the nominated visitor.

8.65 On Thursday 15 April the neurosurgery consultant (Mr A) reviewed Jack and noted that the bleed on his brain was expanding. His plan was to continue providing Jack with the highest level of medical treatment to keep him comfortable, but that there would be no further brain surgery. One of Jack's parents rang that morning and was given an update. Later that day a member of the nursing team rang them to say that one of the consultants treating Jack had suggested they could both visit that day. They did so at 13:00. The following day the plan was to revert to one visitor only.

8.66 The same day, 15 April, one of the consultant haematologists noted in Jack's medical records that they had discussed Jack's case at one of the regular Expert Haematology Panel (EHP) virtual multidisciplinary team meetings that had been instigated in late March 2021, at which developments in the nature and treatment of VITT were shared. The consensus of advice was that continuing as soon as possible with anticoagulants was necessary, despite the ongoing bleeding (which was likely a result of his extensive thrombosis).

8.67 On the morning of Friday 16 April, further CT head and CT venogram scans were performed. The haematology consultants discussed the results, which indicated that the pressure in Jack's brain was still increasing. During the day and evening, the critical care and neurosurgical specialist registrars agreed with the neurosurgery consultant's decision about Jack's care (see 8.59 above). They noted the results of the scans taken that morning and restarted the anticoagulant argatroban.

8.68 In spite of the implementation of all medical and surgical options available, Jack's condition continued to deteriorate with further bleeding, extensive infarction (obstruction of the blood supply) and swelling within the brain resulting in extremely high intracranial pressures.

8.69 In the afternoon of Saturday 17 April, the critical care consultant met with Jack's parents.

The consultant explained that Jack had 'further deteriorated' overnight and was 'approaching end of life'. Jack's parents agreed that a do not resuscitate (DNR) order would be put in place. It was agreed that Jack would continue to receive medical treatment, despite the likelihood that he would not recover, and was at immediate risk of death. His parents were able to stay at his bedside for as long as they wished. The plan was to repeat the brain scan the following morning to assess the progression of the brain injury.

8.70 The treating clinicians had been unable to control his intracranial hypertension. In spite of maximal treatment, his ICP (intracranial pressure) had peaked at 70mmHg (normal range 5 – 15mmHg) at midnight. Since then, Jack's pupils had been fixed and dilated and he had developed features of diabetes insipidus (a condition that can be caused by damage to the hypothalamus or pituitary gland in the brain, in which the body's capacity to balance the levels of fluids in the body is seriously impaired). The clinical evidence was that Jack had sustained catastrophic brain injury and probable loss of brain stem function.

Commentary

C.28. The clinical picture was that of catastrophic brain injury and probable loss of brain stem function. The brain stem is responsible for regulating functions which are essential for life. When a person has been shown to have suffered irreversible loss of brain stem function, clinicians can formally confirm death. This spares the patient from needless interventions, and spares family members from witnessing prolonged and distressing treatments which are not in the patient's best interests. It also enables clinicians responsible for the patient to be confident about discontinuing aggressive treatments which are supporting the function of physiological systems, and to convey to family members the futility of prolonging such interventions when there may be an understandable reluctance to accept that further treatment can be of no benefit.

C.29. Guidance requires the testing of brain stem function to confirm death by formal neurological testing of a number of brain stem reflexes [*A Code of Practice for the Diagnosis and Confirmation of Death*, Academy of Medical Royal Colleges, 2008]. However, there is a set of criteria all of which must be met to allow the diagnosis of death following irreversible loss of brain stem function. These are:

1. Known aetiology [cause] of irreversible brain damage.
2. Exclusion of potential reversible causes of coma.
3. No evidence that this state is due to depressant drugs
4. Primary hypothermia [hypothermia caused by external

temperature] as the cause of unconsciousness is excluded.
5. Potentially circulatory, metabolic and endocrine disturbances have been excluded as the cause of the continuation of unconsciousness.
6. Exclusion of potentially reversible causes of apnoea [inability to breathe spontaneously

8.71 By the morning of Sunday 18 April, Jack's observations indicated that there was still high pressure in his brain. Further CT scan results reviewed by neurosurgeons later that day showed that Jack had extensive haemorrhagic venous infarct involving almost the entire brain. This is a rare form of stroke most commonly the result of cerebral venous thrombosis. Scan results of this kind are considered to show that death is imminent.

8.72 This information was shared with Jack's parents. They were told that they and his sibling could visit and again stay with him for as long as they liked. They asked the clinical team to ensure that Jack's condition had been notified to the appropriate places so that he would be counted in post-vaccination complication numbers, as well as to enable any learning in case this helped to prevent or manage future cases. A member of the NCCU clinical team assured them that the notifications had been done. Jack's case had already been reported to the MHRA through the online yellow card system – the national central platform for reporting of adverse reactions to vaccines. This was also in line with the Expert Haematology Panel (EHP) guidance (7 April 2021). The EHP updated guidance (20 April 2021) stated that probable cases of VITT should also be reported to Public Health England.

8.73 Following discussions with Jack's family, the focus of the critical care team became that of achieving the preconditions for formal neurological diagnosis of death through brain stem testing. This proved challenging, however, because the drugs he was receiving would still have been in his system. On 19 April at 10:05 Dr J (critical care consultant) noted:

'Were we able to satisfy the preconditions, and on the basis of his scans and clinical findings, he is likely to satisfy the criteria for BSD (Brain stem death). However, he is unlikely to satisfy the (precondition) criteria for many days'

8.74 Up until this point the neurology team had continued to treat the high intracranial pressures and as a part of this, the sedation medications had continued. In order to satisfy precondition 3 (as noted in the commentary C29 above), all sedating medications had to be out of Jack's system.

8.75 Dr J explained the management plan with Jack's family, which was noted as including:

1. Stop measuring [intracranial pressure] ICP
2. Stop rocuronium [a paralysing agent] and ketamine [a sedative]

3. Normalise temperature. Once normalised stop midazolam [a sedative] and fentanyl [an opiate]. Not to be given any further STP [a drug used to reduce ICP]
4. Normalise pCO2 [to rule out any respiratory causes of apnoea]
5. Aim for serum NA (sodium) <155
6. Watch fluids
7. Continue argipressin [a drug used to treat diabetes insipidus] to maintain MAP> 70 provided urine OP maintained >40.

8.76 The neurology team documented their support for this plan which was designed to optimise the chances of achieving the pretesting criteria for brain stem death diagnosis.

8.77 Jack's medical notes 24 hours later indicated that he was becoming increasingly unstable from a cardiovascular point of view. By the morning of Tuesday 20 April Jack was no longer breathing spontaneously.

8.78 An apnoea test confirmed that he was not making any effort to breathe spontaneously, and his pupils remained fixed and dilated. It was not yet possible to perform formal brain stem testing, but it was agreed with his family that in Jack's best interests, withdrawal of active treatment should take place. He was duly extubated (the tube that was keeping him ventilated was removed). Jack died with his father present at 11:52 that morning.

Commentary

C.30. It is the opinion of the Facere Melius clinical experts who provided advice for this investigation that the treating multi-disciplinary team went to great lengths to ensure that everybody agreed that it was futile to keep Jack on life support. They also did their utmost to communicate this to his family in a way that would allow them time to absorb this information. Jack's medical team needed to try to achieve formal diagnosis of brain stem death, in accordance with best practice in these circumstances.

C.31. It is understandable however, that once the family had accepted that Jack's death was inevitable and imminent, the time required to achieve the preconditions for formal testing must have been difficult to tolerate. In recognition of this, Dr J made the compassionate decision, in Jack's best interests to withdraw life support rather than prolonging the situation in order to achieve a diagnosis of death in line with the neurological criteria noted above.

8.79 During some of Jack's stay at Addenbrooke's Hospital, his parents stayed in on-site accommodation. Although it was upsetting for them to be restricted to just one nominated visitor for one hour most days, the medical team invited both parents to visit Jack without

time limitations towards the end of his life. They were regularly updated by telephone and in person on his clinical condition by senior medical, surgical and critical care consultants.

8.80 Throughout Jack's stay on the NCCU, there was regular and frequent documentation of meetings with his family and calls to notify them of Jack's deterioration. The critical care, haematology, neurology and neurosurgery consultants did all they could to keep Jack's family informed as much as possible in their decision making and to try to explain the current situation, the plans (including risks and benefits) for treatment and prognosis.

8.81 VITT is an extremely rare new condition without a bank of historical experience on which to base decision making, or to give prognostic indicators based on previous cases. The clinicians themselves were faced with a very complex situation and were collaborating with other centres and the EHP to optimise Jack's treatment and give him the best possible chance of meaningful survival.

8.82 The information given to Jack's parents was explained in non-clinical terms, but in the circumstances it would have been challenging for them to process what they were being told. This would have been further exacerbated by extreme shock and distress that they must have felt.

Commentary

C.32. Before the pandemic, families of critically ill patients would normally be given either unrestricted or modestly restricted visiting rights and would be at the bedside for many hours a day, usually two at a time. As a result, they would become very familiar with the staff looking after their relative and with the ways of working on the unit. Most importantly, there was ample opportunity to have more informal conversations with nursing and resident medical staff. This would help to clarify any points discussed in formal meetings with consultants or indeed to answer any questions which may have arisen as a result of those meetings. It is often the case that families in distress need to hear critical information more than once before they can truly understand and accept it. The difficulty in communicating with families during the pandemic was one of the most challenging aspects of working within the critical care environment. It was a situation which made what would have been a deeply distressing experience for families of critically ill loved ones so much harder to endure, and more difficult to understand because of these restrictions on access and communications.

C.33. Up until the days immediately preceding his death, Jack's family had a much-reduced opportunity to talk informally with nursing staff or have

opportunistic family meetings with medical staff as compared to that available to families before the pandemic. For much of the time, they were only permitted to visit individually. In spite of the treating team's best efforts, they had to process a great deal of complex and distressing information largely on their own and it is therefore not surprising that they felt that communication could have been better.

C.34. Throughout Jack's critical illness there is evidence from clinical documentation and interviews that clinicians communicated regularly with Jack's parents with regard to his condition, the investigations and treatments and the likely prognosis. The clinical picture was extremely rare, involving complex multidisciplinary decision making.

C.35. By the time Jack was transferred to Addenbrooke's Hospital his condition was already very serious. The clinical experts who provided specialist advice to Facere Melius carried out a very detailed and comprehensive review of his medical records during the course of this investigation and concluded that the specialist medical management decisions and care, from the time his condition was diagnosed, were appropriate and of a high standard. All of these experts had experience in caring for and treating patients with VITT.

C.36. When Jack was first admitted to West Suffolk Hospital, there was a concern that he might have a cerebral venous sinus thrombosis (CVST), which could lead to a blood clot in the veins draining the brain, and/or vaccine-induced thrombocytopenia and thrombosis (VITT), because he was known to have recently received the AZ vaccine and his clinical presentation was consistent with CVST/VITT. The AZ vaccine had been recently reported to have produced such an adverse reaction on rare occasions. This information, and his abnormal blood results, should have resulted in an immediate referral to the haematology team.

C.37. Furthermore, the delay in taking a CT venogram, and the misreporting of the initial CT scan of Jack's head, meant that it was nearly 15 hours before the haematology team was contacted, and treatment for CVST/VITT was started.

C.38. It is the opinion of the Facere Melius clinical expert advisers, however, that these delays in establishing a definitive diagnosis of CVST/VITT are unlikely to have made a difference to the overall outcome for Jack. Once he was diagnosed, the care provided at West Suffolk Hospital was appropriate.

Section 9: Other issues considered

9.1 This section provides additional details and comments on key lines of enquiry that have not been covered in preceding sections.

West Suffolk Hospital internal patient safety review

9.2 An essential foundation for improving patient safety in healthcare services is through the identification of and response to patient safety incidents. NHS England guidance (Serious Incident Framework, SIF updated March 2015 – referred to hereafter as the 2015 framework) requires organisations to examine why these occur and report on them to avoid recurrence and so that learning can take place. The 2015 framework has since been superseded by the patient safety incident response framework (PSIRF). At the time of this incident West Suffolk Hospital was participating in the National NHS England Patient Safety Early Adopter Scheme, to prepare for implementation of PSIRF and its methodology for investigating patient safety incidents. This gave the hospital flexibility to use proportionate yet different responses to incidents than those described in the 2015 framework.

9.3 In accordance with section 2.2 of the 2015 framework, Ipswich and East and West Suffolk CCGs had raised Jack's case as a serious incident. As this was going to be a large and complex investigation of a multi-agency sequence of events, and also because of the significance of the COVID-19 vaccination programme, the CCGs took the decision to commission Facere Melius, an independent, external organisation, to conduct it. The investigation would also attempt to provide answers to questions the family were raising. All local organisations were advised of this decision.

9.4 West Suffolk Hospital was asked by the CCGs to contribute to this investigation by producing a timeline/chronology of the events while Jack was under its care. This was used as the basis of a system-wide round table discussion, convened by Ipswich and East and West Suffolk Clinical Commissioning Groups on 7 May 2021. Following this, West Suffolk Hospital undertook a patient safety review, which was shared with Jack's family, and subsequently with Facere Melius.

9.5 During the early stages of the independent investigation, Facere Melius raised concerns about the availability and knowledge of the British Society of Heamatology guidance for VITT. Following discussions the West Suffolk Hospital their patient safety team initiated a patient safety review. This review identified the need to increase the availability of a specialised, venography CT scan.

9.6 In interviews with West Suffolk Hospital's patient safety team, Facere Melius were told that the safety team felt at this stage that they believed they were contributing in this review to the wider independent investigation that was to take place. As part of this patient safety

review, they also produced a short summary and chronology of events while Jack was in their hospital.

9.7 An important point of learning for all trusts implementing PSIRF is to ensure any reviews undertaken are written using accessible language, ideally in plain English and considerate to its readership.

9.8 The hospital's head of patient safety explained to the Facere Melius investigation team that those carrying out the internal patient safety review believed they were being asked to provide a concise clinical review to supplement the wider independent investigation and contribute to learning. The head of patient safety accepted that, in hindsight, as a consequence of this misunderstanding, the patient safety team compromised their normal process, and could have been more objective and detailed in their internal patient safety review. They acknowledged that because it was in the form of a precise clinical review, it did not cover all aspects of Jack's treatment and care, and did not address the incorrect reporting of the CT scan. This was discussed at the radiology governance meeting (see paragraphs 9.8 – 9.12). The report arising from the internal patient safety review was shared with Jack's family. It was not written in a style appropriate for a non-clinical reader, and would have caused upset to the family when they received it.

Reporting of the first CT head scan at West Suffolk Hospital

9.9 As discussed in section 8, when Jack was admitted on 9 April 2021 to West Suffolk Hospital, he had a CT head scan. The results of this scan were inaccurately reported by the 4Ways Healthcare Ltd out of hours radiology reporting service as showing no serious abnormalities. The following morning, West Suffolk Hospital's consultant radiologist noticed this error, and identified that there was in fact indication in the CT scan of a blood clot in the veins draining Jack's brain. Although this would not have provided a conclusive diagnosis of CVST, which came later from a CT venogram, it would have given the on-call consultant information to start treating for VITT that night.

9.10 Part of the West Suffolk Hospital's radiology department's governance arrangements includes a weekly learning meeting. This is a forum at which cases of interest are discussed and peer reviewed. The results of Jack's CT scan were passed on to this meeting because it provided for the radiology team important learning given the gravity of the situation as a result of the pandemic, and the emerging information about serious adverse reactions such as VITT to some COVID-19 vaccinations. This meeting was held on 15 April 2021.

9.11 Dr K, a consultant radiologist, chaired the meeting. They realised the implications of this inaccurate reporting, and contacted 4Ways Healthcare Ltd and asked them to investigate. It was not normal practice for findings at these meetings to be reported to the hospital's patient safety team to consider whether investigation and reporting as a patient safety

incident was needed. The reason for this is that the meetings were informal, specialist conversations, with no formal minutes taken, and the emphasis is on learning for radiologists. There was no opportunity to look at the complete picture of every case, so those attending were not always aware if harm subsequently occurred after the case under discussion came to their attention.

9.12 4Ways Healthcare Ltd carried out a root cause analysis which was led by its audit lead for neurology. This is a private company, whose framework for reviewing cases is different from West Suffolk Hospital's, where the emphasis is on learning. 4Ways Healthcare Ltd considers error rate categorisation, and in this case concluded that this was a category 2: definite omission or interpretation of findings arising from human error. There would have been a strong likelihood of moderate morbidity, but no threat to life.

9.13 4Ways Healthcare Ltd's report was sent to Dr K on 2 June 2021. It had uploaded the findings of its analysis as an addendum to its initial report on the scan reporting. The note by the neuroradiologist states that the report on the hyperdensity shown in the CT scan is indicative of 'probable [C]VST', but that this is not a definitive test. The identification of a probable CVST on the CT scan would lead to empirical treatment (based on the clinical information available at the time) and an urgent transfer for a CT venogram scan in order to confirm the diagnosis conclusively.

Permission sought for publication of case study

9.14 Dr D was the medical registrar for the AAU and involved in Jack's care at West Suffolk Hospital. Dr D was working a day shift (9-5) over the weekend of 10-11 April, and approached Jack for his permission to write a case report about his condition and treatment for the British Medical Journal (BMJ), as VITT-CVST was a newly emerged condition about which little was known. The article would therefore make a useful contribution to clinical learning. The BMJ requires formal consent from the patient, using their consent form 050419 before the article can be submitted for publication. Jack agreed and signed the BMJ consent form. This case report, which was co-authored by Dr D and Dr B, was accepted for publication on 29 May 2021 and published on 16 June 2021.

Recording of Jack's death

9.15 In July 2021 a letter was sent to Jack's home address inviting him for the second dose of the COVID-19 vaccine. It is likely that this was sent by NHS England's national call/recall service. This was over two months after his death. It was very upsetting for Jack's parents to see this invitation, and they have asked for an explanation as to why it happened.

9.16 In seeking to find this explanation, the Facere Melius investigation team established that the

vaccine invitation process relied on a person's eligibility status and vaccine history, which is recorded on the National Immunisation System (NIMS). This electronic system contains records of English patients registered with an NHS number as recorded by the NHS Personal Demographics Service's (PDS) database, the central demographics service for the NHS. This service provides daily updates to NIMS, such as when a person has died, to ensure that all their records are as accurate and up to date as possible. A person is recorded as 'informally dead' in PDS once the notification is received from the GP and hospital. This status remains until the death is confirmed by the Office for National Statistics, at which point the person is recorded as formally dead. This process is subject to organisations making such notifications promptly, and historically there had not been mandated requirements for clinical settings to provide this information or time frames for reporting it.

9.17 Jack's GP practice (Mendlesham Medical Group) had its own protocol in place whereby they normally allowed 14 days to elapse before closing the deceased patient's record. This was to allow for relevant clinical and other information about the patient to be available in their clinical records.

9.18 In Jack's case his GP practice were aware that there was to be a coroner's inquest, and clinicians giving evidence at the inquest would need to be able to access his record. If his GP practice had formally closed Jack's record (a process known as deduction), it was their understanding that all his clinical information would not have been available. Jack's GP practice sent notification of his death via the GP links data feed to Primary Care Support England (PCSE) on 12 July 2021. PCSE, part of Capita plc, provides digital, logistical and support services to front line primary care organisations, including GP practices, on behalf of NHS England. PCSE noted that Jack's record on the Personal Demographics Service (PDS) system was marked as informally deceased as a result of the GP practice removing his registration on that date.

9.19 This meant that Jack's clinical records were still current on the databases that were accessed by the vaccination booking systems as a means of determining who needed to be sent invitations for COVID-19 vaccination. Because of these anomalies in the various processes and systems, the invitation to Jack was sent.

9.20 In October 2021, as part of the ongoing response to COVID-19 and a wider action to improve data quality, the Secretary of State for Health and Social Care directed NHS Digital to investigate and implement ways in which to improve the quality, accuracy and timeliness of death notifications. This was because historically there had been an approximately 20% discrepancy in death notifications reported by clinical settings and those reported by the ONS and the General Register Office [NHS Digital, Data Provision Notice (12 October 2021)].

Plasma exchange

9.21 Jack's family wanted to understand why Jack was not given plasma exchange during his treatment at West Suffolk or at Addenbrooke's hospitals. This procedure could possibly have been used to remove the vaccine-induced antibodies that were causing the clotting in the veins draining Jack's brain.

9.22 The diagnosis of CVST was not confirmed until the CT venogram results were received on 10 April 2021. Jack was started on a treatment regime including the use of anticoagulants and immunoglobulin in line with guidance available at the time. The Expert Haematology Panel's guidance advised consideration of plasma exchange. Jack's West Suffolk Hospital clinical records indicate that the haematology team were aware of this advice, but that he would need to be in the expert specialist centre at Addenbrooke's Hospital in Cambridge for this to take place. They contacted the consultant haematologist at Addenbrooke's Hospital just before Jack's transfer there on 11 April and recorded that he concurred with their management plan to date.

9.23 While Jack was being treated and cared for at Addenbrooke's Hospital, his clinical team were also aware of the guidance about the possibility of using plasma exchange, and considered whether this was suitable for Jack on a number of occasions. It was their clinical judgement that it was not. There was no evidence that plasma exchange would be effective in VITTs. Subsequent guidance (29 July 2021) from NICE (NG200) stated that there was an absence of evidence of its effectiveness in treating VITT immune response. It added that this procedure was 'more invasive' and 'not regarded as a first-line approach to treating [VITT]'. Plasma exchange would also have removed the immunoglobulin in the first session, and so reversed any effect of previous treatment.

9.24 At the coroner's inquest into Jack's death on 12-13 December 2022, the Addenbrooke's consultant haematologist who treated Jack there (Dr L) said that plasma exchange would need to be completed over a period of five to seven days, and each session would last two and a half hours. Such a procedure would not only potentially remove the vaccine-induced antibodies, but also an amount of haemoglobin, which carries oxygen to the blood, and there would be a risk of a reduction in blood pressure, and the risk of a transfusion reaction. Ideally for a plasma exchange to be undertaken, a patient should be stable and not too ill. At that time, because of the bleed in Jack's brain, and the platelet count, he was seriously ill, and therefore plasma exchange was not considered suitable or safe.

Section 10: Conclusion

10.1 This was a very tragic situation, and an extremely distressing time for Jack's parents and his sister. They had many questions about how he came to have the AZ vaccine, and about his care and treatment when he became unwell, and his condition which deteriorated so rapidly. This investigation set out to address the key lines of enquiry that were developed in collaboration with Ipswich and East and West Suffolk Clinical Commissioning Groups, NHS

England, and Jack's family, as well as some of the additional questions raised by his family. Some of those questions relating to his care and treatment at West Suffolk and at Addenbrooke's hospitals were answered at Jack's inquest.

10.2 Jack's death was a consequence of a combination of system shortcomings, human error, and tragic unfortunate timing. He was invited to receive a COVID-19 vaccination before he should have been because of information conaintained in his GP practice's electronic records system. This system recorded his parent's clinical condition, which classified them as at-risk and the information that his own telephone number was that of his parents' landline. Both of these factors resulted in his being included in the extended cohort of eligibility for a COVID-19 vaccine.

10.3 Jack received the AZ vaccine on 30 March 2021, shortly before guidance on giving the AZ vaccine changed, and an alternative to AZ vaccine was recommended for under-30s, given the newly-emerged data on rare but adverse reactions in this cohort. The main side-effect was by then known to be vaccine-induced thrombocytopenia and thrombosis (VITT). This was also just a day before the advice from NHS England to those responsible for administering the delivery of the COVID-19- 19 vaccine was published (reference NHSE C1228). This made it necessary for those in the recently extended eligibility criteria called to receive the vaccine to provide documentary proof of their 'household contact' status, that is that they lived (most or all of the time) with a clinically vulnerable person. Jack would not have met this criterion.

10.4 The Suffolk GP Federation, which was providing the vaccine delivery in Jack's area, were being proactive in extending their vaccine invitations to the recently expanded cohort of eligible adults. They were doing their best to maximise the number of people being vaccinated against this deadly virus, while minimising wastage of the AZ vaccine – which had prescriptive storage/handling requirements and a short in-use shelf-life. At the time of Jack's invitation in March 2021, they had received a large delivery of the AZ vaccine that was due to expire within a few days.

10.5 A week after his vaccination, Jack began to be unwell: he had severe headache, vomited, and was sensitive to light. By this time the government guidance about possible side effects caused in his age-group after receiving the AZ vaccine was changing. Initially the government advised that the benefits of the vaccines outweighed the very slight risks, and the public should continue to get their vaccine when invited to do so (gov.uk website, updated 7 April 2021). Subsequent advice (posted on the same date) cited the updated JCVI advice. This was that for under- 30s who had been prioritised for the vaccine because of their risk of passing on the infection to vulnerable individuals with whom they had close contact, it was '*preferable for them to be offered an alternative*' to the AZ COVID-19 vaccine '*if available'* [NHS England, ref. C1245, 7 April 2021].

10.6 If Jack had not been invited to have the AZ vaccine early, he would have been in a much later cohort (starting 8 June 2021), by which time people under 30 were to be offered Pfizer or Moderna vaccines. It should also be noted, however, that VITT-like cases have also emerged around and soon after the time of Jack's death in some people after they received mRNA vaccines, including Pfizer and Moderna [Chevassut et al, Expert Haematology Panel (EHP), Royal College of Physicians (RCP), Royal College of Emergency Medicine (RCEM), Society of Acute Medicine (SAM), Eun-ju Lee et al].

10.7 Having heard in the media the stories about adverse side effects to the AZ vaccine, his family urged Jack to seek medical advice, which he did. He went to West Suffolk Hospital on 9 April 2021. His blood test results were abnormal, and could have been an indication of possible VITT. To verify this possibility, a CT venogram was ordered. Because of staff constraints, this was not possible, and a plain CT head scan was performed instead.

10.8 The CT scan results did identify a blood clot in the veins draining Jack's brain, but this was not identified in the radiologist's report, and Jack was misreported as having no brain abnormalities. It was not until the following day that the CT venogram (CTV) was performed, and this correctly identified the blood clot, which has subsequently been established to have been caused by his body's reaction to the AZ vaccine. The delay in providing this accurate diagnosis held back the treatment he received for about 15 hours.

10.9 Although it is not clear if this delay would have changed the outcome for Jack, this was still a missed opportunity to have started the medication regime for VITT as early as possible, and/or to have transferred him immediately to a hospital that could have undertaken the CT venogram and provided the expert specialist treatment he needed. Secondary to this the guidance at the time indicated treating without CVST being confirmed, based on his blood results and medical history (see C15-22). Jack's treatment during the rest of his time in Addenbrooke's Hospital was in line with current guidance. The clinicians who treated Jack at West Suffolk and Addenbrooke's hospitals were aware of the latest national guidance on managing cases of people who had symptoms of a serious adverse reaction to the COVID-19 vaccine.

10.10 When Jack's condition deteriorated, he was transferred (on 11 April 2021) to Addenbrooke's Hospital in Cambridge, which provides specialist support for cases like Jack's. The treatment he received there was judged by the Facere Melius clinical expert advisers to this investigation to be appropriate and of a high standard. Despite the best efforts of the teams treating Jack there, his condition continued to worsen. Jack died on the morning of 20 April 2021.

10.11 It should be acknowledged that this was still a very turbulent time at the height of the

COVID-19 pandemic, and the NHS and hospitals and their staff were under enormous pressure because of the high infection rates, and many people became critically ill with the virus. Restrictions on social contacts, including hospital visiting, were in place, and this added to the distress of Jack's family.

10.12 Knowledge of the virus and its mutations and virulence was growing all the time, and the vaccines being developed had only been approved recently. Guidance on best practice in delivering the AZ vaccine was therefore in a state of flux as new information constantly became available.

10.13 What also contributed to this challenging environment locally and nationally when Jack became ill was that VITT was a newly emerged condition, and clinicians and public health organisations were still learning about it.

10.14 The Facere Melius investigation team would like to extend their condolences to Jack's parents, sister and his wider family for the distress and suffering they have experienced during this very difficult time for them.

Section 11: Inquest into Jack's death, 12 - 13 December 2022

11.1 The Ministry of Justice provides guidance for registered medical practitioners on the Notification of Deaths Regulations (2019). It sets out the circumstances in which a notification should be made to the coroner. One of these circumstances is where a death was due to a person undergoing any treatment or procedure of a medical nature. (See appendix fourteen for the full document. Paragraph 19 includes examples of scenario this section applies to). Jack's death was therefore notified by Addenbrooke's Hospital to the coroner on the day he died.

11.2 Following this notification, the coroner made a decision to hold an inquest into Jack's death.

11.3 The purpose of an inquest is to establish the facts around a person's death; it is not a trial. An inquest will seek to answer four main questions: who the deceased person was and how, when and where they died, and to provide the details needed for their death to be registered.

11.4 Jack's inquest was held over two days,12 -13 December 2022, and a number of witnesses from West Suffolk and Addenbrooke's hospitals were called to give their account of the clinical management and treatment decisions they made while Jack was in their care. Following this evidence, the coroner returned a narrative conclusion, which is a short, neutral but factual statement on how a person came by their death.

11.5 The coroner concluded that Jack died of a blood clot to the brain caused as a direct result of his body's reaction to the AstraZeneca COVID-19 vaccination that he received on 30 March 2021.

Section 12: Recommendations

12.1 There are four opportunities identified for learning and improvement, these include

- the importance of primary care coding of diagnosis in patient records, differentiating when a diagnosis is still active or should be considered to be 'resolved'
- the administration of phone numbers in the primary care setting, the current nationally used form does not prompt patients to ask for telephone numbers no longer in use to be removed
- when a new disease emerges, how is guidance developed and disseminated nationally quickly, ensuring those who gatekeep access to services have the latest information?
- how clinical systems support the recording of a deceased patient to ensure the personal demographics service is updated whilst enabling a GP practice to update and administrate the deceased's record

12.2 Eleven years prior to the vaccination programme, in April 2010, one of Jack's parents had a diagnosis of mild COPD recorded in their primary care record under the care of a previous GP practice. There were no further reviews or active treatment after 2016. The COPD stayed active on their record until it was resolved on 19 May 2021. The COPD was active for the parent when the search for cohort 6 cohabitees was made. This led to the parent being classified into cohort six for the vaccinations, adults aged 16 to 65 in an at-risk group.

Recommendation one: NHS England, should consider developing guidance for GPs on when to move active diagnosis codes to 'resolved' codes.

12.3 On 10 June 2019, Jack completed the NHS GMSA amendment form to update his phone numbers; the form did not ask if the previous number should be kept or updated. Since 2021, GP practices have been required to provide an online facility for their patients to inform them of their personal/contact details or other demographic information. Five options satisfy this requirement. However, two options, email and web forms, currently do not ask the patient about historical information, i.e. telephone numbers.

Recommendation two: NHS England should review its current guidance to include a check for out-of-date or decommissioned telephone numbers.

12.4 In response to unexpected thrombocyte side effects the Expert Haematology Panel at the British Society of Haematology was convened, to rapidly develop guidance. The first guideline was published on its website and promoted using social media on 24 March,

followed by five further updates. On 23 April 2021 the UK Health Security Agency published guidance on the Clinical investigation and management of COVID-19 vaccine induced thrombosis and thrombocytopenia. Latterly the Royal College of Medicine, in partnership with the Society for Acute Medicine and Royal College of Physicians, published guidance in May. In the meantime, on 26 April 2021, the National Medical Director wrote to NICE asking them to develop a COVID-19 rapid guideline on VITT which was published on 29 July 2021.

Recommendation three: The Department of Health and Social Care should consider developing an MOU between national agencies, royal colleges, and professional bodies to ensure that guidance on newly emerging diseases are co-ordinated and published as widely and as quickly as possible.

12.5 Following Jack's death he was sent an invite for his second vaccination. This was due to how his death was recorded on the local primary care system, which provides data to the Personal Demographics Services. In October 2021 NHS Digital published a Data Provision Notice on Mandating mortality updates onto the Personal Demographics Service.

Recommendation four: All Integrated Care Boards should seek to assure themselves that every practice has implemented the requirements of the Data Provision Notice.

Section 13 – Appendices

Appendix one	Terms of reference
Appendix two	Key lines of enquiry
Appendix three	Documents received and reviewed
Appendix four	Chronology of events
Appendix five	National organisations involved in multifactorial investigation
Appendix six	National lockdown timeline
Appendix seven	Vaccine development timeline
Appendix eight	Cohorts
Appendix nine	Clinical risk groups
Appendix ten	Information for recipient
Appendix eleven	Quality Outcomes Framework (QOF)
Appendix twelve	Expert Haematology Panel Guidance (7 April 2021)
Appendix thirteen	Capacity chronology
Appendix fourteen	Revised guidance for registered medical practitioners on the Notification of Deaths Regulations (March 2020)

Appendix one – Terms of Reference

Terms of reference for
the independent investigation into the passing of Jack Last
on the 20th April 2021

1. To provide a chronology of events starting from the point (yet to be identified) when any entry into Jacks medical records led to him being called for a vaccination through to his passing on the 20th April 2021.

2. To examine the sequence of events that led to Jack being call for vaccination. This should include, but not be limited to a review of:
   - all of the information recorded in Jack medical records
   - the events that led to jack being called for vaccination
   - the impact of the NHSE/I vaccination 'no waste' objective
   - if decision-making processes to call Jack were taken in line with national and regional guidance

3. To examine the care and treatment provided to Jack from being given the vaccine on the 30th March through to his passing on the 20th April 2021. This will include risk assessments and mitigations, diagnostic tests, clinical treatment, care planning, communication and involvement of the Last family. This will include, but not be limited to the following care providers:
   - Mendlesham Health Centre, Jacks GP Practice
   - Suffolk GP Federation Community Interest Company, commissioned to deliver the vaccine service
   - GP in the Community service (provider to be established)
   - West Suffolk Hospital
   - Addenbrookes Hospital

4. To examine additional external contributory factors, including but not limited to the,
   - authorisation process of the vaccination
   - national and international identification of, the response to and the timeliness of guidance published for treatment of vaccine induced Immune Thrombocytopenia and Thrombosis (VITT), also referred to as rare blood clots
   - national chief medical office statements with regard to the risks associated with blood clots and receiving the vaccine

5. To identify missed opportunities of care, treatment and any service delivery issues along with root causes that may have contributed to them between 30th March 2021 date and 20th April 2021

6. To make recommendations for change at all levels (local, regional and national) to prevent similar events occurring in the future

7. To review the governance arrangements and decision-making prior to and during Jack's journey of care including, but not limited to:

- Suffolk and North-East Essex CCGs, Primary Care Network Authorisation Process
- Suffolk and North-East Essex CCGs, Vaccination Programme Team
- Mendlesham Health Centre, Jacks GP Practice
- Suffolk GP Federation Community Interest Company, commissioned to deliver the vaccine service
- GP in the Community service (provider to be established)
- West Suffolk Hospital
- Addenbrookes Hospital

8. In addition to the Terms of reference the family have requested the following questions are considered within the investigation:
   1. Did Jack receive diagnostics (blood tests and scans) needed to determine suspected VITT in an appropriate time frame?
   2. Did Jack receive appropriate medication and treatment for VITT?
   3. Did Jack receive appropriate medication and treatment for VITT in an appropriate time frame?
   4. Can the batch no of Jack's vaccination be matched up with when the other doses from the same vial were given?
   (As several doses come from one vial, noted on the Gov info, all doses must be used within 6 hours or discarded. As Jack had his vaccination at 8.15am, can we find out if the vial was opened the previous day?)
   5. Does taking research blood samples of suspected VITT cases for P.H.E. take priority over medical treatment beginning?
   (Jack had 7 blood samples taken in W S before any kind of medical treatment himself. Are these samples to take priority over treatment? If not PHE, who was it for? Is this a Gov request?)
   6. How is an AstraZeneca VITT death recorded onto the MHRA weekly total death rate figures?
   (When is a death added – day of death / confirmed by post mortem / confirmed by Coroner's inquest? Has Jack been added to these official figures yet? Who reports this? How do we find out, with proof, that he has been / not been added?)

Addendum added 6th July

9. To understand the circumstances that led to a second dose invitation letter being sent to Jack's home address received over the weekend of 3rd July.

Appendix two – Key Lines of Enquiries (KLOEs)

KLoE 1 - Approval of the vaccine;

- special conditions applied by MHRA
- assurances of manufacture
- relationship between AZ and Indian Serum Institute

KLoE 2 - Commissioning of the vaccine delivery;

- approval of the PCN process
- clinical and corporate governance
- contracting and sub-contracting arrangements

KLoE 3 - Identification of VITT;

- establish the timeline of identification, and development of treatment guidelines
- what investigations have been undertaken by the manufacturer
- reviews undertaken by the MHRA

KLoE 4 - Deployment of the vaccine

- establish the agreements made to deploy the vaccine
- plan in place to deploy short life vaccine
- understand the influence the no waste policy had on decision making
- the construction and implementation of the searches to identify co-habitants in cohort six

KLoE 5 - The vaccination invitation and delivery process

- communication sent to the patient
- identity and verification checks made at the point of delivery
- clinical advice given at the point of vaccination

KLoE 6 - Response to the incident

- the process followed and action taken post-incident
- NHSE Incident guidance followed and implemented
- national serious untoward incident guidance followed
- local relevant policies and procedures

- what clinical/quality governance arrangements were in place surrounding the delivery of the vaccine service
- how effective were the organisations governance processes in relation to this incident

KLoE 7 - Primary Care Management

- establish the timeliness and accuracy of coding in patient parents records
- the impact the secretary of state direction to share clinical records
- the impact of the QCOVID algorithm had on this case

KLoE 8 - NHS 111 assessment and referral

- what advice was sought from and given by NHS 111

KLoE 9 - GP in the Community (fount door of A&E)

- assessment was undertaken and detail of the referral
- information referred to A&E

KLoE 10 - Treatment and care at West Suffolk Hospital

- A&E assessing clinicians' knowledge of the emerging clinical presentation and treatment of VITT
- how the clinical team pursued investigation of a migraine
- the significance of any delay in being reviewed by a haematologist and the treatment of hemoglobulin given
- the facts around the prescription and administration of Hemoglobulin
- how consent was obtained by the Cardiologist, what was consented too
- was care and treatment in line with established best practice
- the decision to transfer
- permissions sought in regard to the publication of an journal article about Jack's case

KLoE 11 - Treatment at Addenbrookes Hospital

- examine the mis-communication issues
- consider any delays in turning off Jacks life support
- establish why blood taken regularly from jack, especially in the last 72 hours of his life

- did the clinical teams have access to the diagnostic tests that were completed at West Suffolk Hospital

KLoE 12 - Recording of Jacks death

- delays of 14 days with GP practice recording Jacks death
- what issues occurred within the Primary Care Support England (PCSE) that meant the Patient Demographic Service was not updated of Jacks death through the automated process
- the events that led to Jack being sent an invitation to have a second vaccine in July 2021

Appendix three – Documents received and reviewed (309)

Records

Clinical records and summary

Vaccine appointments

111 calls

Letter correspondence

Hospital scans

Patient safety review

Coroner statement

Reviews, policies, procedures and minutes

Royal College of Emergency Medicine vaccine pathway concerns

MHRA alerts

JCVI statements, advice and guidance

Intensive Care Society updates

NHS England:

- Greenbook chapters and updates
- COVID 19 enhanced services specification
- Quality and outcomes framework and guidance
- Emergency preparedness, resilience and response framework

Guidance on management of thrombosis with thrombocytopenia

Clinical workstream updates for all vaccination pillars

Vaccination programme guidance for healthcare workers

Summary of Product Characteristics for Vaxzervria

Weekly summaries of Yellow Card reporting

Expert Haematology Panel guidance

COVID-19 rapid guideline: vaccine induced immune thrombocytopenia and thrombosis (VITT)

4ways root cause analysis

AstraZeneca vaccine analysis print

Appendix four – Chronology

The following are extracts taken from the notes, currently they are in medical note form. The editing process has corrected typographical error but not expanded on abbreviations. Red text is specific references to GSC / capacity

FM Case ref		Start date of timeline	March 2013	End date of timeline	June 2021

Date and time	What actually happened
4/3/2013	Current home address: Current home address:[Parents address] [Parents telephone number].
28/3/2013	GP records, family history of asthma and hypertension.
7/6/2019	GP records, Address amendment form.
13/6/2019	Referral letter states home telephone number as parents home telephone number with [his home] address.
30/3/2021	GP Records, Covid 1st dose, AstraZeneca.
9/4/2021	GP Records, case summary for referral to West Suffolk Hospital Emergency Department. Severe headache, sudden onset. Advice - look out for any new symptoms. Patient address location: [Parents address].
9/4/2021	1st Consultant review - Headache post AZ vaccine, improving but not resolved. CTV to rule out venous sinus thrombosis.
09/04/2021 21:25:00	Progress note [Dr 1]: CTV unable to happen overnight, will have to wait until morning. Regular neuro obs. Stay on AAU. WSFT - CT Head final report by [Radiologist 1] - CT Head final report - persistent headache 10 days after AZ vaccine. Conclusion - no acute intracranial abnormality.
09/04/2021 23:56:00	Chest X-Ray - prominent right nipple shadow, no previous films available to compare with. Heart normal.

10/04/2021 09:26:00	CT venogram positive for cerebral venous sinus thrombosis.
10/04/2021 10:15:00	Report CT cerebral venogram: appearances are in keeping with significant cerebral venous sinus thrombosis.
10/04/2021 11:55:00	Diagnosis and management plan explained to Mr. Last. All his concerns addressed…… to be started on Dabigatran (discussed about side effects). Advised to monitor for bleeding. Yellow card issued.
10/04/2021 12:15:00	Covid vaccine received 3 days ago now [*noted that this is an error, vaccine received 30 March 2021 – 11 days prior]*, likely post covid vaccination thrombosis and thrombocytopenia. Send samples for antibody test, commence on IV immunoglobulin, anticoagulation. Please complete yellow card.
10/04/2021 13:46:00	Advised to contact Neurologist at Addenbrookes by [Dr B] Unfortunately, there are busy. Will try again in a bit.
10/04/2021 14:31:00	Discussed with [Dr F] Neurologist on call at Addenbrookes. Plan: no neurological intervention, continue haematology plan. [Dr L] if any concerns.
10/04/2021 17:12:00	Yellow card submitted.
10/04/2021 19:09:00	Concerns from nursing staff and bed managers re appropriate location of care given need for frequent neuro obs and close observation. Discussed with ITU SpR - not for ITU suggest G1 or G8.
11/04/2021 06:05:00	Note confirmed CVST. Asked to see due to increased headache and nausea + vomiting. Headache returned to same severity as when came in, 8-9/10. Vomited 2x with nausea. Has felt lightheaded. Also complaining of pins and needles of left hand. He says he feels that the "clot has moved". Plan: Discussed with [Dr 1]. He has kindly liaised with Addenbrooke's neurology SpR who has recommended CT head
11/04/2021 06:18:00	CT head scan. Clinical Indications: Confirmed CVST. Conclusion. The right parietal lobe acute parenchymal haemorrhage. Neurosurgical evaluation and management advised.

11/04/2021 07:24:00	GCS: 15
11/04/2021 07:24:00	Thank you for contacting me at 6:50am this morning to inform regarding his recent deterioration. CT head demonstrates a large bleed with no midline shift. Medical registrar has already d/w neurosurgical team and are aware of the reversal plan with Idarucizumab. 1. Urgent transfer to Addenbrookes hospital transfer today- it is important that he is managed in a bigger centre- this is a rarre new phenomenon that we are seeing and needs expertise help. Colindale laboratory do not process PF4 Ab samples over the weekend, will process on Monday.
11/04/2021 07:45:00	[Dr 1] – PART 1 - Contacted at about 05:45 by ward doctor due to concerns about worsening headache and a new left homonymous hemianopia. Discussion with Neurology Registrar at Addenbrookes who advises Dabigatran reversal and haematology input. Send urgent repeat coag and platelet count and consider cryoprecipitate depending on results. She will discuss with Addenbrookes Haematologists and feels that he should be transferred to Addenbrookes.
11/04/2021 07:45:00	[Dr 1] – Part 2 - Orion referral made to Neurosurgeons on the advice of the neurologists. Telephone call to Jack's Dad Mike [telephone number] at Jack's request. I have explained that Jack is awake and alert but the combination of the clot and bleeding makes his ongoing management challenging and he is in a serious situation. Mike would like to come in and visit Jack - discussed with nurse in charge who advises that under the circumstances this would be ok. GCS: 15
11/04/2021 07:56:00	Received patient in bed, alert and orientated. Jack has been very anxious and headache is 2-3 overnight around 4am, his headache has been increasing round the clock. doctor, outreach and site manager has spoken to the patient and family regarding update of status.
11/04/2021 07:56:00	GCS: 15
11/04/2021 08:27:00	GCS: 15
11/04/2021	[Dr E] contacted [Dr L]- Consultant Haematologist at CUH- d/w with regards to Mr Last's management.

08:28:00	He concurs with my management plans. Plasma exchange not required as he has received the day 1 immunoglobulin. He is aware that second dose is being considered. In the event of worsening blood-platelet transfusion may be considered as outlined before. He will arrange a Haematology review when patient is transferred under the Neurosurgical team.
11/04/2021 08:28:00	[Dr 2] - Written in retrospect after seeing Jack at 06.30 am. Increased headache and visual changes on left side. Jack had been for repeat CT and awaiting report. Med Reg [Dr 1] present and could see a bleed on the scan. Urgent discussion with Haematologist. Urgent call by [Dr 1] to Addenbrookes Neurology reg on call on arrival on G8. Contacted out of hrs pharmacist to obtain Idarucizumab 5g, reversal of Dabigatran as per Haematology request. Drug not available to prescribe on E care (prescribed on paper chart). Drug given by myself and site manager as per prescription and NICE guidelines at 07.35 (no adverse effects). Full set of bloods taken and sent to lab urgently any deterioration or transfer to Addenbrookes. HPC: CT venogram positive for cerebral venous sinus thrombosis.
11/04/2021 09:27:00	Transfer patient to Addenbrookes. Blue light immediately.
11/04/2021 09:33:00	GCS: 15
11/04/2021 09:38:00	Plan is to be transferred to Addenbrookes today - awaiting confirmation from Addies. Patient remains under close observations. He reports feeling okay today, mum and dad present. Headache has got a bit worse, now rates this a 6/10. Await transfer to Addenbrookes
11/04/2021 10:04:00	GCS: 15
11/04/2021 10:28:00	GCS: 15
11/04/2021 11:05:00	East of England Ambulance e Service documentation of transfer from WSFT to Addenbrookes

11/04/2021 12:46:00	Patient discharged with stable observations, GCS 15, one IV access in situ and no infusions running
11/04/2021 15:13:00	Progress notes. [Dr 3] SPR. Neurology. Neurology review [Dr 4]. Discussed with patient and father. - Didn't bleed because of the treatment he was given. The bleed is caused by the back pressure from the blood clot - continue with blood thinning medication - Transferred for close observation. OE Alert.
11/04/2021 15:44:00	Progress notes: [Dr 5] SPR. Haematology. Started on dabigatran on 10/04 but then reversed with Idarucizumab due to ICH (thought to be associated with the VST). Neurology keen to recommence anticoagulation. All anticoagulation will have some bleeding risk and this should be weighed up against the risk of not anticoagulating. Difficult to recommend Dabigatran as bled whilst on same. Other option includes Fondaparinux but this has a long half life with no reversal agent. The safest option is likely to be an Argatroban infusion although this will require close monitoring. It will also allow for dose titration to minimise degree of anticoagulation.
11/04/2021 19:02:00	Care plan. Staff nurse. Received pt from local hospital - HCA attempted to bleed, unable to. 18:40pm - labs rang saying coag bloods were not good as not enough. Attempted to bleed x2, unable. PA [phlebotomist] called to bleed patient [HG.3], who said they will attempt to come.[HG.4] Called sho to bleed patient.
11/04/2021 19:20:00	Care plan. Staff nurse. Reg stated that ideally we should wait for coag blood results to come back before starting infusion. Patient's parents are very distressed and refusing to leave outside the ward; asking for conversation with senior pre-infusion.
11/04/2021 19:51:00	Progress notes. [Dr 3] SPR. Neurology. Spoke to father on the phone - re-iterated what [Dr 4] had told them earlier
11/04/2021 19:59:00	Resuscitation documentation by staff nurse. Treated with IVIG. Currently awaiting check platelets (delayed due to poor venous access) prior to starting infusion. I note following advice: Suggest, starting on high risk/critically ill patient infusion regime

11/04/2021 20:21:00	Resuscitation documentation by Staff Nurse. Contacted to be made aware that patient is to commence argatroban. B: Venous sinus thrombosis - Right transverse and sigmoid thrombus post Astrazeneca vaccination Treated with dabigatran but developed ICH - reversed with idarucizumab. A: patient not assessed - only went to ward to offer support when infusion start.
11/04/2021 22:10:00	Progress notes [Dr L], Consultant. Haematology. Note this is the first VITT patient who is moderately positive on Acustar HIT screen. This does not affect management but I have flagged him as HIT positive until we can confirm or refute this with a confirmatory assay. If any concern about bleeding, stop infusion - Argatroban will clear within 4-6 h, with a half-life of 45 minutes, similar to heparin, but there is no reversal agent, and no role for Protamine. Email handover from [Dr E], consultant Haematologist from WSH.
11/04/2021 22:10:00	GCS: 15
11/04/2021 23:32:00	GCS: 15
11/04/2021 23:37:00	Addenbrooks Hospital - ondansetron injection
12/04/2021 00:34:00	Transfer to Neuro Critical Care unit
12/04/2021 00:44:00	Lacks capacity
12/04/2021 01:58:00	Infusion of argatroban
12/04/2021 01:59:00	GCS: 13
12/04/2021 03:40:00	GCS: 5
12/04/2021 04:48:00	Care plan. Junior sister. noted patient severe left-sided weakness- Called for [Dr 6] to review patient urgently. Worsening of CT scan, doctors contacting neurosurgery, asked them to update parents.

12/04/2021 06:16:00	Lacks capacity
12/04/2021 06:27:00	Relative communications by Clinical Fellow. I spoke to his father to update him. CTH showed some increase in the haematoma size. So, he developed left side weakness. Continue on IV anticoagulant.
12/04/2021 08:50:00	Relative communications by Staff Nurse. Aware of current situation and overnights events leading to CT which says bleed has extended. Father is understandably very worried about Jack. Remains on anticoagulant medication which we check levels of regularly and adjust accordingly. Aim is to dissolve the clot.
12/04/2021 10:41:00	GCS: 14
12/04/2021 13:00:00	Call to father. GCS more fluctuant. EEG ordered then CT scan
12/04/2021 15:37:00	Relative communications by Clinical Fellow. CT scan showed an increase in swelling around his bleed which would explain his deteriorating conscious level. I explained based on this we made the decision we should put him to sleep with medication so we could optimise the care we are able to give him.
12/04/2021 15:50:00	GCS: 7
12/04/2021 16:30:00 - 16:51:00 -	Jack given Propofol and Fentanyl (16:30) and subsequently intubated (16:51)
12/04/2021 17:15:00	Call with family regarding deteriorating consciousness
12/04/2021 17:41:00	Progress notes. [Dr 7] Consultant. NCCU - I have discussed with neurosurgeons and we are in agreement that he needs a emergency decompressive craniectomy.
12/4/2021 18:02	Form for adults unable to consent to investigation or treatment completed by [Dr5] SPR (attempted to call family but no response)

12/04/2021 18:12:00	Prepare RBC for blood transfusion
12/04/2021 18:41:00	Progress notes. [Dr 8] Clinical Fellow, Neurosurgery. Explained the basis of surgery to parents, the major expected complication will be uncontrollable intracranial bleeding
12/04/2021 18:41:00	Went to surgery in main theatre 22 as emergency
12/04/2021 18:57:00	Progress notes. [Dr 9] Clinical Fellow Haemotology. Haem SPR [Dr 9] Case discussed with [Dr 10]. Was informed there is no scope to delay theatre APTR has not reached therapeutic level on most recently. There is no reversal agent for Agatroban.
12/04/2021 19:35:00	Care plan. Staff nurse. Parents updated prior to surgery this evening. Both very anxious but show good understanding of the situation. PLAN: Emergency theatre. Actively cool to normothermia when return to Unit.
12/04/2021 22:00:00	Transfer to Neuro critical care unit
13/04/2021	GP Records - Letter from Addenbrookes of notification of admission
13/04/2021 01:17:00	Mental capacity statement - inpatient notes. I confirm that I have assessed the capacity of Jack LAST in relation to the decision(s) specified above. It is my opinion that he lacks capacity. Assessment completed by:[Staff nurse 1] Date:13/4/2021, Time: 01:17
13/04/2021 02:56:00	Progress notes written in retrospect [Dr 11] Pre0CT scan - both pupils became unreactive. They remain unreactive
13/04/2021 07:48:00	Progress notes [Dr 11]. Left pupil now working again - right remains unreactive. From notes neurology wish to anticoagulation and neurosurgeons defer when to restart anticoagulation to neurology and haematology
13/04/2021 08:30:00	Call to father. Surgery went well
	Ward round notes. ICU WR [Dr 12]. I would be uncomfortable transferring to CT owing to significantly high ICP on overnight scan (note

13/04/2021 10:27:00	neurosurgery were requesting stealth images). EVD seems to be the plan, however lack of theatre spots. If EVD is being inserted in the next two hrs to remain off, equally high ICPs, large haemorrhage. Unstable. Further hypertonic saline bolus please · If not absorbing switch to nutrition Continue cooling, sedation, paralysis, hyperventilation
13/04/2021 10:28:00	Progress notes. [Pharmacist 1] Pharmacist Must avoid all heparin-based medicines, including flushes.
13/04/2021 10:59:00	Progress notes. [Dr 12], Clinical Fellow. D/W Neurosurgery There is no active plans for EVD currently however, they acknowledge we are at the maximum of his medical management. Ideally, he would have a stealth CT prior to EVD; this is very desirable but not essential if he would not be stable. He asks for me to discuss with [Dr 7]
13/04/2021 11:45:00	Related Notes: 18.00pm - Spoke with Mike again. Theatre went smoothly and the drain is reducing his brain pressures already (expected). He remains in a critical condition but has stabilised somewhat. They would like to be updated with any changes overnight. Staying onsite.
13/04/2021 12:00:00	Call to father. Plan to have CT scan
13/04/2021 13:10:00	Discussion with family. Need to insert drain
13/04/2021 13:10:00	Relative communications by Consultant. Family meeting. Explained that Jack would certainly have died had he not had the decompression yesterday and, in this sense, the operation has been successful. However the brain swelling has continued to be a problem and we need to take further action so that we can maintain control of the pressure on his brain. To this end we are going to place a drain in his brain to drain fluid (CSF). I hope that this will make enough space / buy Jack a bit more time until his swelling starts to reduce in the next days. Once we have operated we will again have to think about anticoagulation. [Dr 7] Consultant in Neurocritical Care
13/04/2021 13:17:00	Progress notes:[Dr 12] Clinical Fellow. CT stealth performed. No significant deterioration.

13/04/2021 15:30:00	Lacks capacity
13/04/2021 18:00:00	Call to father. Theatre went well
13/04/2021 19:31:00	Lacks capacity
13/04/2021 19:57:00	Microbiology - in-patient notes. Microbiology Note. 1. Please send a repeat EVD sample for comparison. 2. If there is clinical suspicion of CNS infection, treat as a post-neurosurgical infection with IV vancomycin and ceftazidime (as per protocol)
13/04/2021 21:46 to 21:51	All orders and results. CT head. [Dr 13] Specialty Registrar. [Dr 14] Consultant. No new intracranial haemorrhage or large vessel territory infarct. Hyperattenuating thrombus within the right transverse and sigmoid sinuses as previously. I agree with the preliminary report without modification
13/04/2021 23:38:00	Progress notes. [Dr 11] ST5 night review Continue current ICP management, Liaise with all teams re commencing argatroban again tomorrow. Hold antibiotics
14/04/2021 07:34:00	Care plan. Staff nurse. Family. Patient's dad rang overnight, password confirmed. Brief update given. Plan: Continue current ICP management ? restart Argatroban - await discussion with haematology and neurology
14/04/2021 14:02:00	Discussion with family. Cannot organise routine visits for both parents
14/04/2021 15:19:00	Lacks capacity
14/04/2021 17:28:00	Relative communications by Staff Nurse Tracey and Mike came to visit Jack today. They were updated by [Dr 15] and by myself. We have explained the actual visiting policy and why from now just one nominated person will be allowed to visit Jack whilst he is in intensive care. They understood….
14/04/2021 21:08:00	Lacks capacity

14/04/2021 23:15:00	Lacks capacity
15/04/2021 01:17:00	Lacks capacity
15/04/2021 02:50 to 03:08	All orders and results. CT Head. [Dr 13] Specialty Registrar . [Dr 16], Consultant. There has been an increase in size of the right temporoparietal parenchymal haematoma, now measuring 80 x 56 x 55 mm compared with 62 x 46 x 40 mm previously. Review by [Dr 16] agrees with report.
15/04/2021 05:17:00	Progress notes, [Dr17], Honorary Consultant NCCU Review. Difficult to control ICPs overnight. Repeat CT head shows increase in right temporoparietal haematoma, new left focus of haemorrhage. Neurosurgical review please · Given Hb drop send haemolysis screen (I suspect it will be negative) · Need to update family about events overnight - I note given relative stability visiting was dropped to one. Given the circumstances can we please allow both parents to come in
15/04/2021 09:00:00	Relative communications by Staff Nurse. Related Notes: Original Note by [Staff Nurse 2] filed at 15/4/2021 10:14 - Phone call Jack's dad Mike. Jack's numbers are stable at the moment , informed Jack had an episode of uncontrollable brain pressure spikes so he had a brain scan. The spikes have settled this morning. We are waiting for the scan results and the doctors' plans for today. 1030 I rang Mike to inform him that both he and Jack's mum Tracey can come visit today so that the doctors can update them, but tomorrow there will only be one visitor allowed. They will visit at 1300.
15/04/2021 09:26:00	Progress notes,[Dr 18], Clinical Fellow. Scan reviewed with [Mr A] expanded bleed within the area of infarct with slight increase of mass effect. Plan: Continue maximal medical therapy. Withhold, anticoagulants (likely the cause of worsening bleed). No further neurosurgical intervention.
15/04/2021 10:30:00	Call to father. Today both parents can visit
15/04/2021 14:24:00	Remote chart review - inpatient notes. {Dr 19], Sp trainee, Haematology. Consultant Haematology –[Dr 20] Discussed Mr Last at the national VITTs MDT (chaired by [Dr 21])

	Although ongoing bleeding, likely to be a result of his extensive thrombosis and there is apressing need for anticoagulation as soon as possible. If in the opinion of the neurosurgeons this is contraindicated, then he should be considered for a thrombectomy. I am more than happy to discuss further.
15/04/2021 14:35:00	Progress notes. [Dr 7], Consultant. NCCU ward round. Handover plan. It may be that we need to anticoagulate but this is risky: We started fondaparinux and, even with this very low dose, we saw an extension of his haemorrhage. I will have a further discussion with haematology and IR later to establish whether we are actually able to control the pro-coagulant state
15/04/2021 16:15 to 16:32	All orders and results. CT Venogram cerebral. Resulted by: [Dr 22] Consultant. The left transverse sinus is patent but there is some non-occlusive thrombus in its mid and anterior sections extending into the upper sigmoid sinus. This has progressed.
15/04/2021 18:06:00	Progress notes. [Dr 7] Consultant. NCCU evening ward round. Very difficult. ICP remains hard to control on maximal therapy. However sodium has fallen a bit so there is scope for hypertonic saline. We have agreed not to intervene tonight. (2) repeat CT venogram tomorrow and look for acute extension · If stable, then not for intervention · Otherwise we can consider ([Dr 22] happy to be contacted). There remains the issue of what to do with anticoagulation. Unlike ward treatment of CVST, the poor intracranial compliance here means that a significant extension of intracranial haemorrhage would be fatal in my opinion and the neurosurgeons are in agreement that full anticoagulation, unfortunately, is likely to result in death (at this point). I agree with that assessment.
15/04/2021 18:12:00	Progress notes. [Dr 23], Clinical Fellow. Documented in retrospect. Conversation between [Dr 7] and [Dr 24] (Neurology Consultant) . There was complete agreement that decisions regarding anticoagulation and/or interventional radiology are extremely difficult in the current position. Any further bleeding is likely to be fatal. However, anticoagulation may be the only option if there is significant extension of the CVST. I note the subsequent discussions with [Dr 22]. [Dr 24] intends to call Jack's family this evening.

15/04/2021 20:30:00	Relative communications by Honorary Consultant, Neurology [Dr 24] Spoke to Mr Last (Jack's father) by phone this evening. He was keen to know the outcome of this afternoon's scan and I explained that while the venogram appears to show more clot in the sinuses compared to the scan from the 10th of April, it is unclear whether this is fresh clot or new clot that formed a few days ago. We discussed that Jack has received what we believe is the correct treatment for the proposed immune reaction that has caused the problem with the blood clotting and the platelets. -- From the neurology perspective, while I agree that anticoagulation is the currently accepted treatment here (even in the presence of haemorrhage as one would do for 'conventional' CVST), this is unlikely to improve the situation acutely and I fully understand the hesitancy given that a further bleed is likely to be fatal. However, if no intervention is felt indicated tomorrow and in the absence of any other contraindication, then the balance should swing towards active anticoagulation as stated above.
16/04/2021 09:40:00	Father called. Jack still critical
16/04/2021 10:49:00	Lack capacity. GCS: 3
16/04/2021 11:41:00	Progress notes, [Dr 24] Honorary Consultant. Neurology Discussion with [Dr 20] and [Dr 25] We note the events overnight and that Jack remains unstable from the ICP perspective. 1. No planned intervention from the neurosurgical perspective, even in the event of deterioration. 2. Jack has experienced a further haemorrhage overnight with no anticoagulation We agreed that we should commence argatroban today. The family will be visiting at 1pm and I will endeavour to meet them shortly afterwards to outline the above
16/04/2021 11:45:00	Relative communications by Staff Nurse. Written in retrospect - Father of the patient rang at 09:40 this morning asking how the patient was doing. He expressed that they would aim to come in for 1 pm to visit this patient. Have informed the Doctors and Consultant of this who will come and speak to the family around 13:30

16/04/2021 13:15:00	Progress notes. [Dr 26], Consultant. Note entered retrospectively. [Dr 7] and I have discussed this case at length today. The addition of further anticoagulation would, I worry, expose the patient to further haemorrhage to a greater extent than the degree of protection offered against extension of the thrombus. In the face of such uncertainty, [Dr 7]'s determination of a cautious approach to anticoagulation is the same one I would take.
16/04/2021 14:57:00	Discussion with family. Consultant gave update on Jack's condition
16/04/2021 17:59:00	Progress notes, Neurology. PAF. Yellow card/MHRA reference
16/04/2021 18:59:00	GCS: 3
16/04/2021 20:18:00	Progress notes – [Dr 27], SPR. Reviewed over course of this evening. As discussed with both [Dr25] and [Dr 28] before - already on maximal ICP management and has had surgical decompression. - no further room for escalation beyond the current level therefore we have to accept this Neurosurgical opinion sought to support above - but they were busy in theatres · Spoke to [Dr 29] (Neurosurgical SPR) - agree no further neurosurgical intervention would be of benefit here"
17/04/2021 00:13:00	Progress notes - inpatient. [Dr 30] SPR. CTH/CTV result noted - argatraban paused, immediately contacted haematology. Discussed with consultant haematologist [Dr 20]. His feeling was that this deterioration likely represents a poor prognosis, echoing the feeling of the teams involved during the day. Discussed with [Dr 28] - in view of impression from haematology, agrees restarting argatraban sensible.
17/04/2021 05:50:00	Lacks capacity
17/04/2021 07:30:00	Lacks capacity
17/04/2021 10:36:00	Progress notes – [Dr 25]. NCCU. Events and progress noted. Problem list updated. Impression: approaching end of life. Update family - serious concern regarding further deterioration, plan to rescan tomorrow to assess the extent of progression - in case of cardiac arrest CPR would be futile

17/04/2021 13:53:00	Consultations - inpatient notes: Consultant Haematologist – [Dr 20] I note that the clinical situation is continuing to worsen in view of the complications of a raised ICP. To continue on steroids and anticoagulation for now
17/04/2021 15:18:00	Discussion with family. DNACPR. Prognostic outlook unclear
17/04/2021 15:18:00	Relative communications by Consultant . Related Notes: Original Note by [Dr 25], Consultant (Consultant) filed at 17/4/2021 15:41 Meeting with parents - consultant room Further deterioration overnight despite maximal medical treatment. I was asked to explain why we had not started plasma exchange. I tried to clarify that Jack was too unstable for plasma exchange - a rapid shift in electrolytes and washing out of sedatives and vasopressors could have precipitated a potentially lethal intracranial hypertension crisis. Jack is at immediate risk of life. Dad and mum are allowed to be at his bedside for as long as they wish.
17/04/2021 15:34:00	Lacks capacity
17/04/2021 20:59:00	Lacks capacity
18/04/2021 08:26:00	Lacks capacity
18/04/2021 13:14:00	GCS: 7
18/04/2021 Afternoon	Discussion with family. Plan to reduce ICP. Nothing more they can offer
18/04/2021 14:18:00	Progress notes - inpatient. [Dr 31], Neurology. CT Head reviewed. I agree with [Dr 25]'s assessment. Compared to the last scan there is significant worsening.
18/04/2021 18:23:00	Discussion with family. Update on CT
18/04/2021 20:06:00	GCS: 7
18/04/2021 22:44:00	Lacks capacity

19/04/2021 10:21:00	Discussion with family. Talked through process of withdrawing sedative
19/04/2021 12:55:00	Discussion with family. Encouraged to take some time away
19/04/2021 12:55:00	Relative communications by Staff Nurse Jack's parents (Tracey & Mike) have been at the bedside throughout the morning; they were joined by Jack's sister late morning.Tried to encourage Tracey and Mike to take some time, maybe even go home later this afternoon for the evening but they would rather stay and be with Jack. Tracey, Mike, and [sister] are all very concerned and anxious that with the sedative medications being turned off that Jack may be in pain. Both myself and [Dr 11] have reassured them that if we see any signs that Jack is at all distressed then we will act on it with use of appropriate medication straight away and he will not suffer.
19/04/2021 18:45:00	Discussion with family. Sedation off now
19/04/2021 21:19:00	Lacks capacity. GCS: 1.
20/04/2021 08:09:00	Lacks capacity. GCS: 1
20/04/2021 09:50:00	Discussion with family. Waiting for consultant to discuss next steps
20/04/2021 11:11:00	Discussion with family. Time to take Jack off ventilator
20/04/2021 11:30:00	Discussion with sister. Jack will be given Morphine
20/04/2021 12:02:00	Progress notes - inpatient notes: ST5 [Dr 11] Offered to give Jack 2.5mg morphine just before we extubated him… Death confirmed with Mike at bedside at 11.53. May he rest in peace.
04/06/2021 16:36:00	Email from Cambridgeshire Coroner to medical practice: The Senior Coroner for Suffolk is now investigating the death of Jack Michael LAST The Coroner would also like details regarding how, and why, Jack Last was contacted about receiving a Covid-19 vaccine as he was not in one of the specified age groups at the time.

Appendix five - National organisations involved in multifactorial investigation

Department of Health and Social Care
The Department of Health and Social Care (DHSC) is a department in the UK government responsible for overseeing the health and social care systems in England. The department works to improve the health and well-being of people in the country, ensuring that they receive high-quality care and treatment when they need it. Their responsibilities include managing the NHS, developing policies and strategies to improve health outcomes, regulating health and social care providers, and overseeing the funding and delivery of social care services.

NHS England/Improvement (now known as NHS England)
NHS England is responsible for setting the overall strategy and priorities for the NHS, whilst NHS Improvement is responsible for overseeing the performance of NHS providers (such as hospitals and community health services) and for supporting them to improve their services. They merged in April 2019 and now work together as a single organisation.

Addenbrooke's Hospital (part of Cambridge University Hospitals NHS Foundation Trust)
Addenbrooke's Hospital is a large teaching hospital located in Cambridge. It is part of the Cambridge University Hospitals NHS Foundation Trust and serves as the principal teaching hospital for the University of Cambridge School of Clinical Medicine. They provide a wide range of medical services, including general and specialist surgery, cancer care, neurology, cardiology, and orthopaedics. In addition to its clinical services, it is also a major centre for medical research and innovation.

Primary Care Support England, provided by Capita
Primary Care Support England (PCSE) is an organization that provides administrative and support services to primary care providers in England. PCSE is part of the NHS Business Services Authority, which is responsible for providing support services to the NHS.

Medicines and Healthcare products Regulatory Agency (MHRA)
The Medicines and Healthcare products Regulatory Agency (MHRA) is an executive agency of the UK government responsible for regulating medicines, medical devices, and blood components for transfusion in the UK. It is responsible for ensuring that these products are safe and effective, and for monitoring their safety once they are on the market. This includes approving new drugs and medical devices for use in the UK, conducting post-market surveillance to monitor their safety, and taking action to protect public health if safety concerns arise. The MHRA also provides advice and guidance to healthcare professionals, industry, and the public on the safe use of medicines and medical devices and

works closely with other regulatory bodies around the world to ensure a coordinated approach to drug and medical device regulation.

The National Institute for Health and Care Excellence

The National Institute for Health and Care Excellence (NICE) provides national guidance and advice to improve health and social care. NICE's role is to provide evidence-based guidance and recommendations for the prevention, diagnosis, and treatment of various medical conditions. This guidance is based on research and reviews of the latest available evidence, and it is intended to help healthcare professionals, patients, and the general public make informed decisions about healthcare options.

National Immunisation Management Service

The National Immunisation Management Service (NIMS) is a digital system that supports the delivery of the national immunisation programme in England. It is designed to help healthcare professionals manage the administration of vaccines, record and track immunisations, and monitor vaccine uptake. It was launched in 2021 in response to the COVID-19 pandemic to support the roll-out of the COVID-19 vaccination programme in England. NIMS allows healthcare professionals to record the details of vaccinations given to individual patients, including the type of vaccine, the date of administration, and the site of the injection. It also provides information on vaccine stocks and usage and can generate reports on vaccine uptake and coverage.

British Society for Haematology (BSH)

The British Society for Haematology (BSH) is a professional society and registered charity in the United Kingdom that promotes the practice and study of haematology, which is the branch of medicine concerned with the study of blood and blood disorders. The BSH provides a range of services to its members, including access to educational resources, conferences and events, and networking opportunities. The society also produces guidelines and standards of care for the management of haematological disorders and supports research in the field through its grant programmes and research collaborations. Additionally, the BSH advocates for the needs of patients with blood disorders and supports efforts to improve access to high-quality haematology care across the UK.

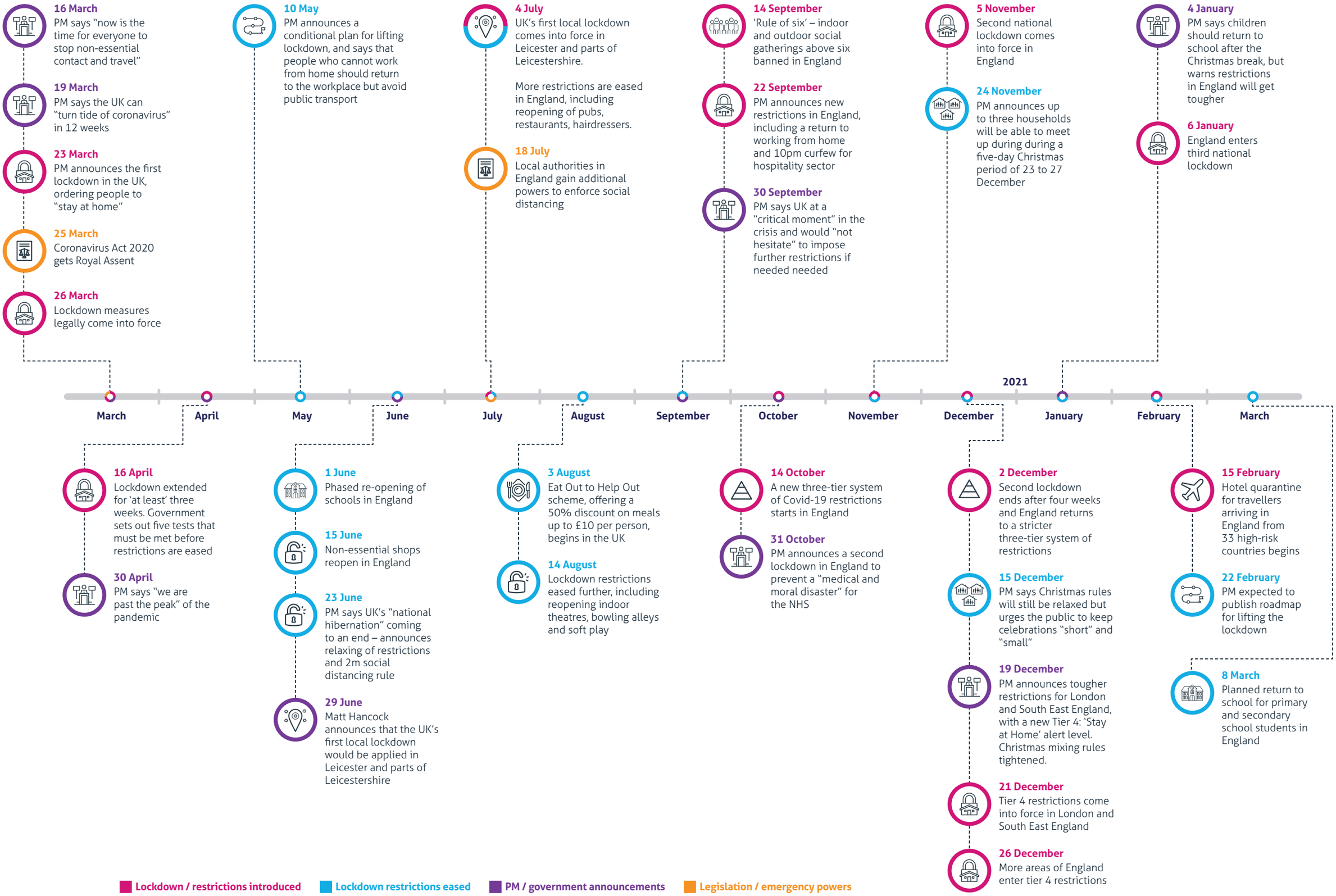
The Expert Haematology Panel (part of BSH)

The Expert Haematology Panel is a specialist committee within the British Society for Haematology (BSH) that provides expert guidance and advice on the diagnosis and management of haematological disorders. The panel is made up of experienced haematologists who are recognized experts in their respective fields of haematology. The Expert Haematology Panel is responsible for developing and updating BSH guidelines and standards of care for the management of various blood disorders. These guidelines cover a wide range of topics, including the management of bleeding and thrombotic disorders, the

use of anticoagulants and antiplatelet agents, the diagnosis and treatment of haematological malignancies, and the management of inherited and acquired bleeding disorders.

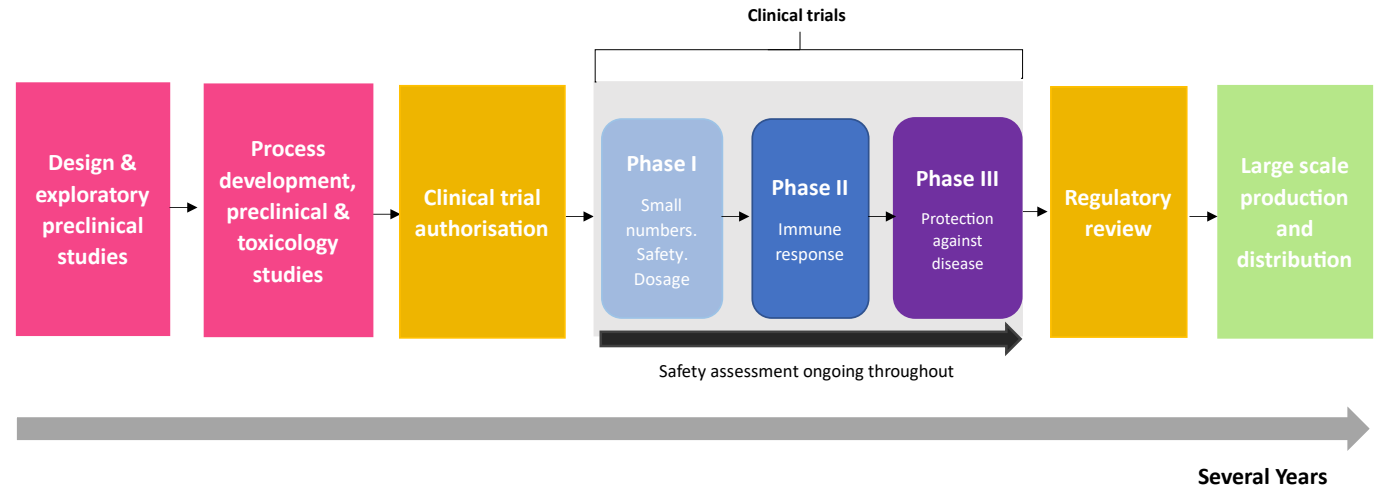
Appendix six – National lockdown timeline

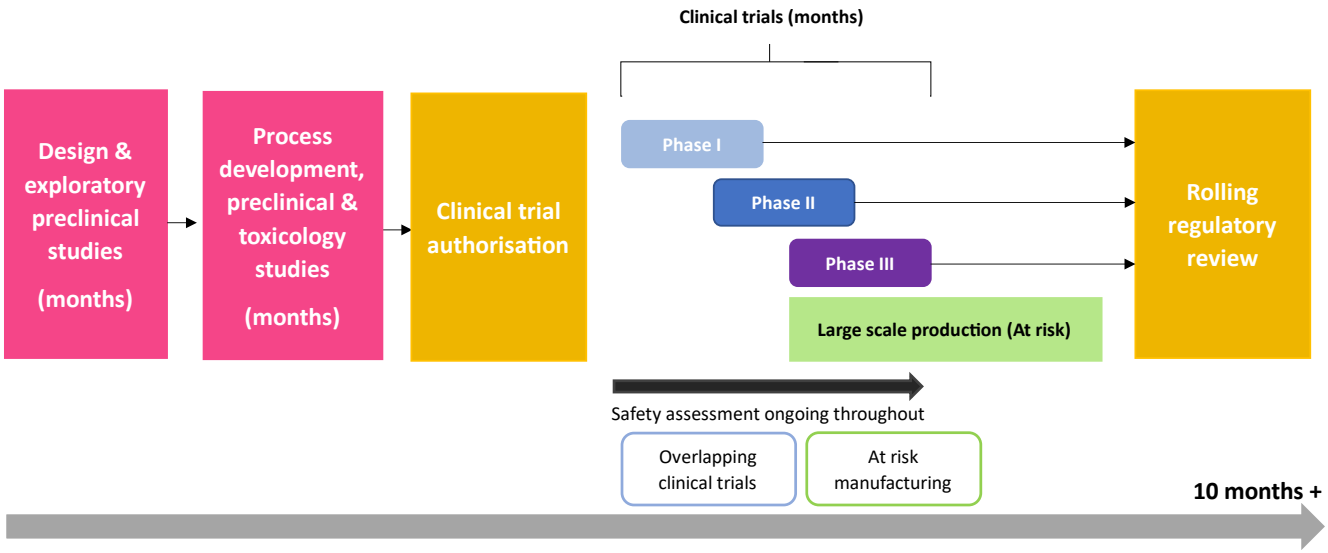
Timeline of UK coronavirus lockdowns, March 2020 to March 2021



Source: Institute for Government analysis.

Appendix seven – Vaccine development timeline





(Diagrams from Department of Health & Social Care (DHSC), UK Covid-19 vaccines delivery plan (updated 11 January 2021))

Appendix eight – Cohorts

Taken from The Green Book, V7, chapter 14a, page 9, table 2 (12 February 2021).

Priority group	Risk group
1	Residents in a care home for older adults Staff working in care homes for older adults
2	All those 80 years of age and over Frontline health and social care workers
3	All those 75 years of age and over
4	All those 70 years of age and over Clinically extremely vulnerable individuals (not including those under 16 years of age)
5	All those 65 years of age and over
6	Adults aged 16 to 65 years in an at-risk group
7	All those 60 years of age and over
8	All those 55 years of age and over
9	All those 50 years of age and over

Appendix nine – Clinical risk groups

Taken from The Green Book, V7, chapter 14a, page 10, table 3 (12 February 2021).

Chronic respiratory disease	Individuals with a severe lung condition, including those with asthma that requires continuous or repeated use of systemic steroids or with previous exacerbations requiring hospital admission, and chronic obstructive pulmonary disease (COPD) including chronic bronchitis and emphysema; bronchiectasis, cystic fibrosis, interstitial lung fibrosis, pneumoconiosis and bronchopulmonary dysplasia (BPD).
Chronic heart disease and vascular disease	Congenital heart disease, hypertension with cardiac complications, chronic heart failure, individuals requiring regular medication and/or follow-up for ischaemic heart disease. This includes individuals with atrial fibrillation, peripheral vascular disease or a history of venous thromboembolism.
Chronic kidney disease	Chronic kidney disease at stage 3, 4 or 5, chronic kidney failure, nephrotic syndrome, kidney transplantation.
Chronic liver disease	Cirrhosis, biliary atresia, chronic hepatitis.
Chronic neurological disease	Stroke, transient ischaemic attack (TIA). Conditions in which respiratory function may be compromised due to neurological disease (e.g. polio syndrome sufferers). This includes individuals with cerebral palsy, severe or profound learning disabilities, Down's Syndrome, multiple sclerosis, epilepsy, dementia, Parkinson's disease, motor neurone disease and related or similar conditions; or hereditary and degenerative disease of the nervous system or muscles; or severe neurological disability.
Diabetes mellitus	Any diabetes, including diet-controlled diabetes.
Immunosuppression	Immunosuppression due to disease or treatment, including patients undergoing chemotherapy leading to immunosuppression, patients undergoing radical radiotherapy, solid organ transplant recipients, bone marrow or stem cell transplant recipients, HIV infection at all stages, multiple myeloma or genetic disorders affecting the immune system (e.g. IRAK-4, NEMO, complement disorder, SCID). Individuals who are receiving immunosuppressive or immunomodulating biological therapy including, but not limited to, anti-TNF, alemtuzumab, ofatumumab, rituximab, patients receiving protein kinase inhibitors or PARP inhibitors, and individuals treated with steroid sparing agents such as cyclophosphamide and mycophenolate mofetil. Individuals treated with or likely to be treated with systemic steroids for more than a month at a dose equivalent to prednisolone at 20mg or more per day for adults. Anyone with a

	history of haematological malignancy, including leukaemia, lymphoma, and myeloma and those with systemic lupus erythematosus and rheumatoid arthritis, and psoriasis who may require long term immunosuppressive treatments. Most of the more severely immunosuppressed individuals in this group should already be flagged as CEV. Individuals who are not yet on the CEV list but who are about to receive highly immunosuppressive interventions or those whose level of immunosuppression is about to increase may be therefore be offered vaccine alongside the CEV group, if therapy can be safely delayed or there is sufficient time (ideally two weeks) before therapy commences. Some immunosuppressed patients may have a suboptimal immunological response to the vaccine (see Immunosuppression and HIV.)
Asplenia or dysfunction of the spleen	This also includes conditions that may lead to splenic dysfunction, such as homozygous sickle cell disease, thalassemia major and coeliac syndrome.
Morbid obesity	Adults with a Body Mass Index ≥40 kg/m².
Severe mental illness	Individuals with schizophrenia or bipolar disorder, or any mental illness that causes severe functional impairment.
Adult carers	Those who are eligible for a carer's allowance, or those who are the sole or primary carer of an elderly or disabled person who is at increased risk of COVID-19 mortality and therefore clinically vulnerable.[1]
Younger adults in long-stay nursing and residential care settings	Many younger adults in residential care settings will be eligible for vaccination because they fall into one of the clinical risk groups above (for example learning disabilities). Given the likely high risk of exposure in these settings, where a high proportion of the population would be considered eligible, vaccination of the whole resident population is recommended. Younger residents in care homes for the elderly will be at high risk of exposure, and although they may be at lower risk of mortality than older residents should not be excluded from vaccination programmes (see priority 1 above). For consideration of children under 16 see below

[1] Those clinically vulnerable to COVID include children with severe neuro-disabilities, those who are designated Clinically Extremely vulnerable (CEV), adults who have underlying health conditions (as defined in table 3), and those who need care because of advanced age. Eligible carers should be vaccinated in priority group 6.

Appendix ten – Information for recipient

P053940

Package leaflet: Information for the recipient

COVID-19 Vaccine AstraZeneca solution for injection

COVID-19 Vaccine (ChAdOx1-S [recombinant])

This medicinal product has been given authorisation for temporary supply by the UK Department of Health and Social Care and the Medicines & Healthcare products Regulatory Agency. It does not have a marketing authorisation, but this temporary authorisation grants permission for the medicine to be used for active immunisation of individuals aged 18 years and older for the prevention of coronavirus disease 2019 (COVID-19).

Reporting of side effects

As with any new medicine in the UK this product will be closely monitored to allow quick identification of new safety information. You can help by reporting any side effects you may get. See the end of section 4 for how to report side effects.

Read all of this leaflet carefully before the vaccine is given because it contains important information for you.

- Keep this leaflet. You may need to read it again.
- If you have any further questions, ask your doctor, pharmacist or nurse.
- If you get any side effects, talk to your doctor, pharmacist or nurse. This includes any possible side effects not listed in this leaflet. See section 4.

What is in this leaflet

1. What COVID-19 Vaccine AstraZeneca is and what it is used for

COVID-19 Vaccine AstraZeneca is a vaccine used to protect people aged 18 years and older against COVID-19.

COVID-19 is caused by a virus called coronavirus (SARS-CoV-2).

COVID-19 Vaccine AstraZeneca stimulates the body's natural defences (immune system). It causes the body to produce its own protection (antibodies) against the virus. This will help to protect you against COVID-19 in the future. None of the ingredients in this vaccine can cause COVID-19.

2. What you need to know before you receive COVID-19 Vaccine AstraZeneca

Do not have the vaccine:

- If you have ever had a severe allergic reaction to any of the active substances or any of the other ingredients listed in section 6. Signs of an allergic reaction may include itchy skin rash, shortness of breath and swelling of the face or tongue. Contact your doctor or healthcare professional immediately or go to the nearest hospital emergency room right away if you have an allergic reaction. It can be life-threatening.

If you are not sure, talk to your doctor, pharmacist or nurse.

Warnings and precautions

Tell your doctor, pharmacist or nurse before vaccination:

- If you have ever had a severe allergic reaction (anaphylaxis) after any other vaccine injection;
- If you currently have a severe infection with a high temperature (over 38°C).
  However, a mild fever or infection, like a cold, are not reasons to delay vaccination;
- If you have a problem with bleeding or bruising, or if you are taking a blood thinning medicine (anticoagulant);
- If your immune system does not work properly (immunodeficiency) or you are taking medicines that weaken the immune system (such as high-dose corticosteroids, immunosuppressants or cancer medicines).

If you are not sure if any of the above applies to you, talk to your doctor, pharmacist or nurse before you are given the vaccine.

As with any vaccine, COVID-19 Vaccine AstraZeneca may not protect everyone who is vaccinated from COVID-19. It is not yet known how long people who receive the vaccine will be protected for. No data are currently available in individuals with a weakened immune system or who are taking chronic treatment that suppresses or prevents immune responses.

Children and adolescents

No data are currently available on the use of COVID-19 Vaccine AstraZeneca in children and adolescents younger than 18 years of age.

Other medicines and COVID-19 Vaccine AstraZeneca

Tell your doctor, pharmacist or nurse if you are taking, have recently taken or might take, any other medicines or vaccines.

Pregnancy and breastfeeding

If you are pregnant or breastfeeding, think you may be pregnant, or are planning to have a baby, **tell your doctor, pharmacist or nurse**. There are limited data on the use of COVID-19 Vaccine AstraZeneca in pregnant or breastfeeding women. Your doctor, pharmacist or nurse will discuss with you whether you can be given the vaccine.

Driving and using machines

COVID-19 Vaccine AstraZeneca has no known effect on the ability to drive and use machines. However, side effects listed in section 4 may impact your ability to drive and use machines. If you feel unwell, do not drive or use machines.

COVID-19 Vaccine AstraZeneca contains sodium and alcohol (ethanol)

This medicine contains less than 1 mmol sodium (23 mg) per dose of 0.5 ml. This means that it is essentially 'sodium-free'.

This medicine contains a very small amount of alcohol (0.002 mg of alcohol (ethanol) per dose of 0.5 ml). This is not enough to cause any noticeable effects.

3. How COVID-19 Vaccine AstraZeneca is given

COVID-19 Vaccine AstraZeneca is injected into a muscle (usually in the upper arm).

You will receive 2 injections. You will be told when you need to return for your second injection of COVID-19 Vaccine AstraZeneca.

The second injection can be given between 4 and 12 weeks after the first injection.

When COVID-19 Vaccine AstraZeneca is given for the first injection, COVID-19 Vaccine AstraZeneca (and not another vaccine against COVID-19) should be given for the second injection to complete vaccination course.

If you miss your second injection

If you forget to go back at the scheduled time, ask your doctor, pharmacist or nurse for advice. It is important that you return for your second injection of COVID-19 Vaccine AstraZeneca.

4. Possible side effects

Like all medicines, this vaccine can cause side effects, although not everybody gets them. In clinical studies with the vaccine, most side effects were mild to moderate in nature and resolved within a few days with some still present a week after vaccination.

If side effects such as pain and/or fever are troublesome, medicines containing paracetamol can be taken.

Side effects that occurred during clinical trials with COVID-19 Vaccine AstraZeneca were as follows:

Very Common (may affect more than 1 in 10 people)
- tenderness, pain, warmth, redness, itching, swelling or bruising where the injection is given
- generally feeling unwell
- feeling tired (fatigue)
- chills or feeling feverish
- headache
- feeling sick (nausea)
- joint pain or muscle ache

Common (may affect up to 1 in 10 people)
- a lump at the injection site
- fever
- being sick (vomiting)
- flu-like symptoms, such as high temperature, sore throat, runny nose, cough and chills

Uncommon (may affect up to 1 in 100 people)
- feeling dizzy
- decreased appetite
- abdominal pain
- enlarged lymph nodes
- excessive sweating, itchy skin or rash

In clinical trials there were very rare reports of events associated with inflammation of the nervous system, which may cause numbness, pins and needles, and/or loss of feeling. However, it is not confirmed whether these events were due to the vaccine.

If you notice any side effects not mentioned in this leaflet, please inform your doctor, pharmacist or nurse.

Reporting of side effects

If you get any side effects, talk to your doctor, pharmacist or nurse. This includes any possible side effects not listed in this leaflet.

If you are concerned about a side-effect it can be reported directly via the Coronavirus Yellow Card reporting site https://coronavirus-yellowcard.mhra.gov.uk/ or search for MHRA Yellow Card in the Google Play or Apple App Store and include the vaccine brand and batch/Lot number if available.

By reporting side effects you can help provide more information on the safety of this vaccine.

5. How to store COVID-19 Vaccine AstraZeneca

Keep this medicine out of the sight and reach of children.

Your doctor, pharmacist or nurse is responsible for storing this vaccine and disposing of any unused product correctly.

Storage

Do not use COVID-19 Vaccine AstraZeneca after the expiry date which is stated on the carton. The expiry date refers to the last day of that month.

Store in a refrigerator (2°C to 8°C).

Do not freeze.

Keep vials in outer carton to protect from light.

The vaccine does not contain any preservative and should be administered by a healthcare professional. After the first dose is withdrawn, the vaccine should be used as soon as practically possible and within 6 hours. During use it can be stored from 2°C to 25°C.

Disposal

COVID-19 Vaccine AstraZeneca contains genetically modified organisms (GMOs). Any unused vaccine or waste material should be disposed of in accordance with local requirements. Spills should be disinfected with an appropriate antiviral disinfectant.

6. Contents of the pack and other information

What COVID-19 Vaccine AstraZeneca contains

One dose (0.5 ml) contains:

COVID-19 Vaccine (ChAdOx1-S* recombinant)

5×10^{10} viral particles

*Recombinant, replication-deficient chimpanzee adenovirus vector encoding the SARS-CoV-2 Spike glycoprotein. Produced in genetically modified human embryonic kidney (HEK) 293 cells.

This product contains genetically modified organisms (GMOs).

The other excipients are L-histidine, L-histidine hydrochloride monohydrate, magnesium chloride hexahydrate, polysorbate 80, ethanol, sucrose, sodium chloride, disodium edetate dihydrate, water for injections.

What COVID-19 Vaccine AstraZeneca looks like and contents of the pack

Solution for injection. The solution is colourless to ~~slightly~~ brown, clear to slightly opaque and particle free.

Pack sizes (not all pack sizes may be marketed):
- 10 dose vial (5 ml) in packs of 10 vials.
- 8 dose vial (4 ml) in packs of 10 vials.

Manufacturer

MedImmune UK Ltd
6 Renaissance Way
Liverpool, L24 9JW
United Kingdom

For any information about this medicine, please contact:

AstraZeneca UK Ltd

Tel: 08000541028

This leaflet was last revised in 12/2020

Other sources of information

www.azcovid-19.com

Appendix eleven – Quality Outcomes Framework (QOF)

Quality and outcomes framework

The Quality and Outcomes Framework (QOF) is a voluntary incentive program introduced in 2004, that aims to support contractors to deliver quality care. It is a system for performance management and payment of GPs. The aim of it is to improve quality of care provided by GPs and to reward practices for the delivery of high quality care. Practices are assessed on their achievement of the QOF indicators, with points awarded for each achievement. The total number of points achieved determines the level of financial reward that a practice receives. The framework consists of a series of indicators that cover a range of areas, including clinical indicators, patient experience indicators and public health indicators. It is updated annually to reflect changes in clinical evidence and priorities.

Disease registers

Disease registers are used by general practices to identify patients with certain chronic conditions, such as diabetes, hypertension, asthma, and chronic obstructive pulmonary disease (COPD). Once identified, patients are added to the practice's disease register and are monitored regularly for their clinical parameters and outcomes. Disease registers help practices to better manage and monitor the care of their patients with chronic conditions, and to ensure that they receive the appropriate treatment and support. Within the QOF, disease registers are used to determine which patients are eligible for certain quality indicators and clinical targets. For example, if a patient with COPD is added to the practice's COPD disease register, the practice is then responsible for ensuring that the patient receives routine check-ups. Disease registers also provide valuable data for public health monitoring and research, and can be used to evaluate the effectiveness of interventions and treatments for chronic conditions.

Exceptions off the register

In the context of disease registers, "exceptions'' refer to patients who have been removed from a disease register for a particular clinical indicator despite having the condition. Sometimes there may be reasons why a patient cannot meet certain clinical targets or quality indicators, even with appropriate treatment and support, for example not being able to attend regular appointments for physical health monitoring. To qualify for an exception, the practice must document a valid reason why the patient cannot meet the clinical target, and must ensure that the patient receives appropriate alternative care or treatment. However, it is important that exceptions are used appropriately and that patients who are exceptions still receive appropriate care and treatment for their condition.

Changes to register for COPD

Year	Indicator ID	Indicator	Change
2020/2021	COPD007	(The percentage of patients with COPD who have had influenza immunisation in the preceding 1 August to 31 March)	Now **12 points** In 2019/2020 it was 6 points
2019/2020	COPD004	The percentage of patients with COPD with a record of FEV1 in the preceding 12 months	**Retired**, Not required on an annual basis to guide care coupled with issues with access to annual spirometry in general practice
2019/2020	COPD005	The percentage of patients with COPD and Medical Research Council dyspnoea grade ≥3 at any time in the preceding 12 months, with a record of oxygen saturation value within the preceding 12 months	**Retired**, Not in line with NICE guidance
2019/2020	COPD008	The percentage of patients with COPD and Medical Research Council (MRC) dyspnoea scale ≥3 at any time in the preceding 12 months, with a subsequent record of an offer of referral to a pulmonary rehabilitation programme	New indicator, High impact intervention for patients with COPD
2017/2018	No change		
2016/2017	No change		
2015/2016	No change		
2014/2015	COPD007	The percentage of patients with COPD who have had influenza immunisation in the preceding 1 August to 31 March	Wording changed, and timeframe changed from September to August

2013/2014		Indicator IDs changed from format COPD ## to COPD00#	
2013/2014	COPD004	The percentage of patients with COPD with a record of FEV1 in the preceding 12 months	'12 months' was changed from 15 months
2013/2014	COPD003	The percentage of patients with COPD who have had a review, undertaken by a healthcare professional, including an assessment of breathlessness using the Medical Research Council dyspnoea scale in the preceding 12 months	'12 months' was changed from 15 months
2013/2014	COPD005	The percentage of patients with COPD and Medical Research Council dyspnoea grade ≥3 at any time in the preceding 12 months, with a record of oxygen saturation value within the preceding 12 months. NICE 2012 menu ID: NM63	New indictor
2012/2013	Copd8	The percentage of patients with COPD who have had influenza immunisation in the preceding 1 September to 31 March	Payment stages increased from 40-85% to 45-80%
2011/2012	No change		
2009/2010	COPD 13	The percentage of patients with COPD who have had a review, undertaken by a healthcare professional, including an assessment of breathlessness using the MRC dyspnoea score in the preceding 15 months	Point changed from 7 to 9

Appendix twelve – Expert Haematology Panel Guidance 7 April 2021

Guidance produced from the Expert Haematology Panel (EHP) focussed on Covid-19 Vaccine induced Thrombosis and Thrombocytopenia (VITT)

Updated Guidance on Management. Version 1.3 7 April 2021

Note this is a live document and is updated frequently as further information comes to light

There are currently no robust data to inform management of this condition. In the absence of evidence, these are pragmatic guidelines based on experience of managing alternative similar conditions and the theoretical risks and benefits of interventions. As evidence emerges, recommendations are expected to change. Patient management should be individualised according to specific circumstances.

A rare syndrome of thrombosis, often cerebral venous sinus thrombosis, and thrombocytopenia is being noted after COVID-19 vaccination and is highlighted as affecting patients of all ages and both genders; at present there is no clear signal of risk factors.

Clinicians need to be on alert for this syndrome, to understand how to make the diagnosis and to note the specifics of how to treat it. The Expert Haematology Panel (EHP) offers MDT support for management of cases.

Probable cases must be reported to the EHP and Public Health England via this link https://cutt.ly/haem_AE. Additionally, all cases of thrombosis or thrombocytopenia occurring within 28 days of COVID-19 vaccine must be reported to the MHRA via the online yellow card system https://coronavirus-yellowcard.mhra.gov.uk/

DEFINITE CASE:

Cases usually present 5-28 days after vaccination and are characterised by thrombocytopenia, raised D Dimers and progressive thrombosis, with a high preponderance of cerebral venous sinus thrombosis. Pulmonary embolism and arterial ischaemia are also common. Bleeding can be significant and unexpected.

- Typical laboratory features include a platelet count <150 x10^9/L, very raised D Dimer levels above the level expected for VTE and many develop low fibrinogen levels.

- Antibodies to platelet factor 4 (PF4) have been identified and so this has similarities to heparin-induced thrombocytopenia (HIT), but in the absence of patient exposure to heparin treatment. PF4 antibodies are detected by ELISA HIT assay but not usually shown by other HIT assay methods.

Suggested actions to be taken for the identification and management of suspected cases:

POSSIBLE CASE:

Any patient presenting with acute thrombosis and new onset thrombocytopenia within 28 days of receiving COVID 19 vaccination

Investigations

1. FBC- specifically to confirm thrombocytopenia <150x 10^9/L
2. Coagulation screen, including Clauss fibrinogen and D Dimers
3. Blood film to confirm true thrombocytopenia and identify alternative causes

Guidance produced from the Expert Haematology Panel (EHP) focussed on Covid-19 Vaccine induced Thrombosis and Thrombocytopenia (VITT)

UNLIKELY CASE:

- Reduced platelet count without thrombosis with D dimer at or near normal and normal fibrinogen.
- Thrombosis with normal platelet count and D dimer <2000 and normal fibrinogen

PROBABLE CASE:

- D Dimers > 4000 mcg/L (D Dimers 2000-4000 mcg/L may need to be treated as per probable case)

1. Send serum sample for PF4 antibody assay (ELISA HIT assay). Please see below *

Management of a Probable Case – Treat first while Awaiting Confirmatory Diagnosis:

1. GIVE intravenous immunoglobulin urgently as this is the treatment most likely to influence the disease process. Give 1g/kg (divided into two days if needed), irrespective of the degree of thrombocytopenia, and review clinical course. Further IvIg may be required balancing bleeding and thrombotic risk.
2. AVOID platelet transfusions. Discuss any required interventions. If neurosurgery is required, this should not be delayed, and if platelet count is <100 $x10^9$/L a platelet transfusion will be appropriate after, or with, ivIg.
3. AVOID all forms of heparin including heparin-based flushes. (It is unknown whether heparin exacerbates the condition but until further data is clear, this is best avoided).
4. CORRECT fibrinogen if needed, to ensure level does not drop below 1.5 g/L, using fibrinogen concentrate or cryoprecipitate
5. When fibrinogen is >1.5 g/L and platelets >30 $x10^9$/L consider starting anticoagulation. If anticoagulation is needed before then, critical illness dose argatroban can be considered, initially without dose escalation and maintained at low dose.
6. ANTICOAGULATE with non-heparin-based therapies such as DOACs, argatroban, fondaparinux or danaparoid depending on the clinical picture. Bleeding and thrombotic risk needs to be carefully balanced and lower doses may be appropriate while platelet count is still low.
7. Steroids should be considered and in particular if there is a delay giving ivIg.
8. Plasma exchange may also be considered.
9. Avoid thrombopoietin receptor agonists
10. Antiplatelet agents are not recommended based on current experience
11. If no overt thrombosis, but thrombocytopenia with raised D Dimer, thromboprophylaxis with non-heparin-based anticoagulants should be considered – balancing bleeding and thrombotic risk. DOAC, fondaparinux or danaparoid can be used.
12. Please inform the Expert Haematology Panel (uclh.vatt@nhs.net) and please discuss your cases at the 2pm daily MDT meeting

CONFIRMED CASE

If PF4 antibodies positive by ELISA:

1. Continue ongoing treatment as above
2. Serum sample to Colindale for Covid-19 antibody testing and storage*
3. EDTA sample for whole genome sequencing – please email Anita.Hanson@liverpoolft.nhs.uk with the patient details so you can be sent barcoded sample tubes, an information pack and consent form

Guidance produced from the Expert Haematology Panel (EHP) focussed on Covid-19 Vaccine induced Thrombosis and Thrombocytopenia (VITT)

If there is a high index of clinical suspicion but PF4 antibodies are negative, please send serum and EDTA anyway and discuss before changing treatment.

***Samples:**

1. **Anti PF4** assays by ELISA based technique should be done locally or can be sent to Filton NHSBT or UCLH. HIT assay using Accustar and Diamed have generally shown negative results and so cannot be relied upon.

2. **Serum** should also be sent to Colindale for Covid antibody test and storage:

For the attention of Kevin Brown
Virus Reference Department
National Infection Service
Public Health England
61 Colindale Avenue
London, NW9 5EQ

https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/950573/E59m_lab_request_form_vw_2289_01.pdf

Please use the code VATTS for easy identification.

3. **EDTA** for whole genome sequencing - email Anita.Hanson@liverpoolft.nhs.uk with patient name, dob, gender, NHS number and location, to receive barcoded blood bottles and a document pack with patient information and consent form

Consent is obtained using 100K approved PILs and CFs and there are options for deceased and patients lacking capacity. The Research Ethics Opinion for this study is in line with a Research Tissue Bank approval therefore individual Trust approval is not required. However if needed, Anita will liaise with the referring Trust's Research & Development and provide the Genomics England Research Library letter to notify the department of the recruitment activity.
This ethics covers England, Wales & Northern Ireland. Conversations are ongoing for Scotland.

Report the case!

1. Please enter case details on this link which is quick and easy to use https://cutt.ly/haem_AE

2. It is also **crucial** that the MHRA **online yellow card** is completed https://coronavirus-yellowcard.mhra.gov.uk/

Discharge:

Continue anticoagulation for at least 3 months. If thrombosis was only arterial, once D Dimers, platelets and fibrinogen have returned to normal, the patient can be switched to an antiplatelet agent and continued for 3 months. Monitor platelet count closely to observe for relapse and consider repeating PF4 ELISA at day 28 from presentation.

Guidance produced from the Expert Haematology Panel (EHP) focussed on Covid-19 Vaccine induced Thrombosis and Thrombocytopenia (VITT)

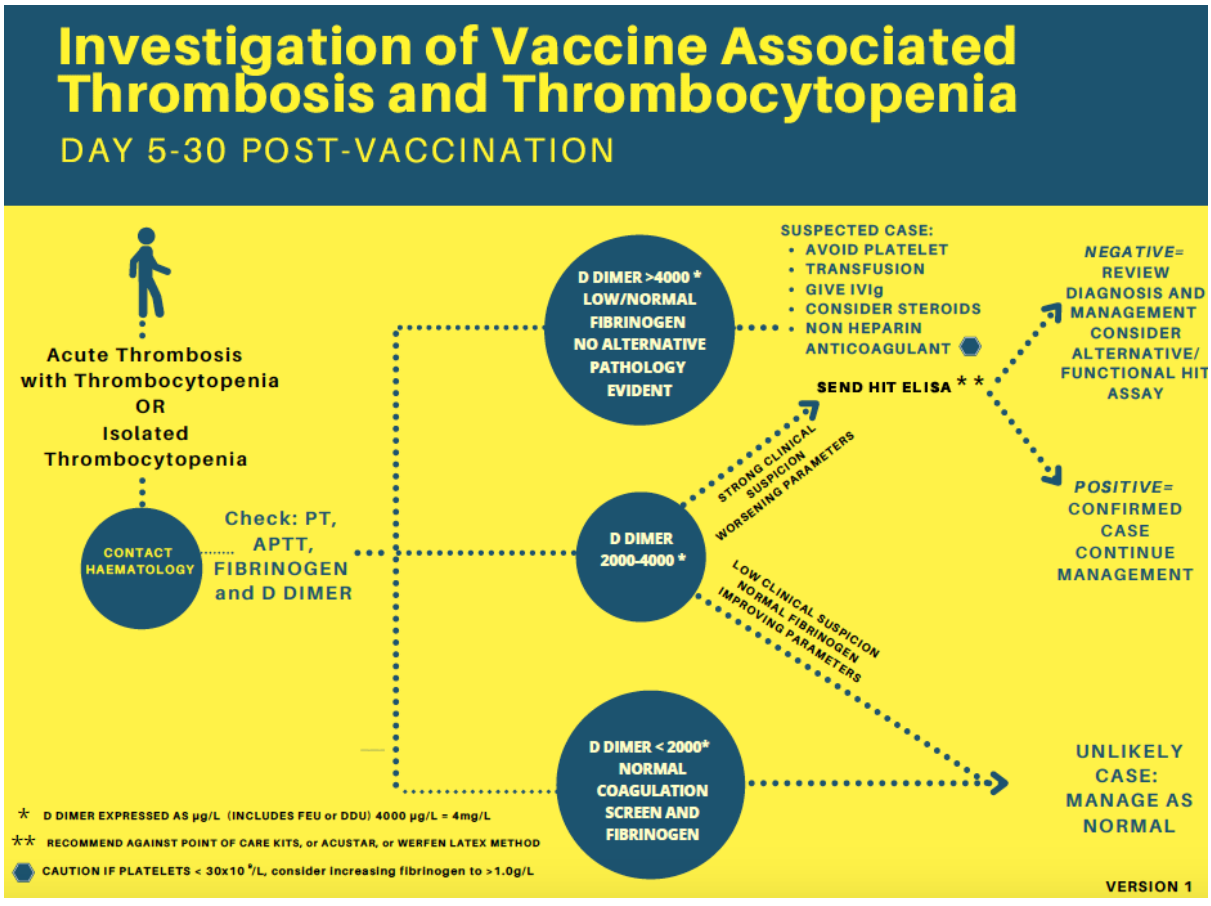
Further Vaccination:

Those either affected by, or under investigation for this complication should **not** receive their second vaccine until the stimulant for this condition is clear.

Themes/learning points from the daily meetings:

1. If neurosurgery is deemed necessary, this should not be delayed. If platelet transfusion is required, give IVIG before/with platelet transfusion.
2. If coronary artery thrombosis was in healthy (not atherosclerosed) vessels (thrombotic myocardial infarction), anticoagulation is preferred over antiplatelet agents, until the fibrinogen, D Dimers and platelet count have normalised. Then it may be appropriate to switch to antiplatelet agents.
3. Argatroban levels ideally should be monitored by a Direct Thrombin inhibitor assay, if available, e.g. HEMOCLOT as APTT correlates poorly with the argatroban effect due to the high levels of Factor VIII.
4. Switch to fondaparinux or a direct oral anticoagulant, as soon as the bleeding risk is considered to have reduced, given that these patients are highly prothrombotic and argatroban monitoring results may not reflect therapeutic anticoagulation.
5. Most Clauss fibrinogen assays may give falsely low fibrinogen results during concurrent use of argatroban. Assays that use high concentrations of thrombin e.g. 100 UNIH/ml may be more accurate.

Management algorithm:



Appendix thirteen – Capacity chronology

Capacity Chronology

**GCS – see glossary for more detail (3 and 8 on the coma scale; emergency care is required immediately as a severe head injury is present. Those with scores of 9–11 are considered to have a moderate head injury, and those with a score of 12 or higher are considered to have a mild head injury.)*

FM Case ref	Suffolk and NE Essex	Start date of timeline	11 April	End date of timeline	20 April
Time	**What actually happened**				
11 APRIL					
07:24	GCS: 15				
07:45	Call to dad. Transfer to Addenbrookes today. GCS: 15				
07:56	GCS: 15				
08:27	GCS: 15				
09:33	GCS: 15				
10:04	GCS: 15				
10:28	GCS: 15				
12:46	GCS: 15				
15:13	Discussion with parents and Jack. Continue blood thinning medication				
19:51	Call to father. Primary problem is blood clot				
22:10	GCS: 15				

23:32	GCS: 15
12 APRIL	
00:44	Lacks capacity
01:59	GCS: 13
03:40	GCS: 5
06:16	Lacks capacity
06:27	Spoke to father. Updated on CTH. Plan is to continue IV anticoagulant
08:45	Call to father. No plan for surgery, remains on anticoagulant
10:41	GCS: 14
11:15	Call to father. Visit set up for afternoon
13:00	Call to father. GCS more fluctuant. EEG ordered then CT scan
14:00	Family visit. Informed of decision to sedate due to increase in swelling, levels of consciousness fluctuant
15:50	GCS: 7
17:15	Call with family regarding deteriorating consciousness
18:02	Attempted to call family, no reply
18:41	Discussion with family. Explained the basis of surgery (went to theatre at 18:57)
13 APRIL	
01:17	Lacks capacity
08:30	Call to father. Surgery went well
12:00	Call to father. Plan to have CT scan
13:10	Discussion with family. Need to insert drain
15:30	Lacks capacity

18:00	Call to father. Theatre went well
19:31	Lacks capacity
14 APRIL	
14:02	Discussion with family. Cannot organise routine visits for both parents
15:19	Lacks capacity
17:28	Family visit. Explained visiting policy
21:08	Lacks capacity
23:15	Lacks capacity
15 APRIL	
01:17	Lacks capacity
09:00	Call to father. Jack's number are stable at the moment
10:30	Call to father. Today both parents can visit
20:30	Call to father. High chance that Jack will not survive
16 APRIL	
09:40	Father called. Jack still critical
10:49	Lack capacity. GCS: 3
14:57	Discussion with family. Consultant gave update on Jack's condition
18:59	GCS: 3
17 APRIL	
05:50	Lacks capacity
07:30	Lacks capacity
11:08	Father called. Asked for update, wait for consultant

15:18	Discussion with family. DNACPR. Prognostic outlook unclear
15:34	Lacks capacity
20:59	Lacks capacity
18 APRIL	
08:26	Lacks capacity
13:14	GCS: 7
Afternoon	Discussion with family. Plan to reduce ICP. Nothing more they can offer
18:23	Discussion with family. Update on CT
20:06	GCS: 7
22:44	Lacks capacity
19 APRIL	
10:21	Discussion with family. Talked through process of withdrawing sedative
12:55	Discussion with family. Encouraged to take some time away
18:45	Discussion with family. Sedation off now
21:19	Lacks capacity. GCS: 1.
20 APRIL	
08:09	Lacks capacity. GCS: 1
09:50	Discussion with family. Waiting for consultant to discuss next steps
11:11	Discussion with family. Time to take Jack off ventilator
Around 11:30	Discussion with sister. Jack will be given Morphine

Appendix fourteen – Revised guidance for registered medical practitioners on the Notification of Deaths Regulations (March 2020)

Ministry of Justice

Revised guidance for registered medical practitioners on the Notification of Deaths Regulations

March 2020

The Notification of Deaths Regulations 2019 are modified when specific provisions in the Coronavirus Act 2020 are implemented.

This revised Guidance applies only when the modified Regulations are in force.

No other version of this Guidance should be used during that period.

This revised Guidance will no longer apply once the modified Regulations cease to be in force.

If you are unsure whether this revised Guidance applies, please contact coroners@justice.gov.uk.

The revised guidance is highlighted in the pink text boxes.

Contents

The notification requirement

The Notification of Deaths Regulations 2019 are modified when specific provisions in the Coronavirus Act 2020 are implemented.

This revised Guidance applies only when the modified Regulations are in force.

No other version of this Guidance should be used during that period.

This revised Guidance will no longer apply once the modified Regulations cease to be in force.

When the modified Regulations are in force there is no duty to notify a death to the coroner where there is a medical practitioner who may complete the medical certificate cause of death (MCCD) within a reasonable time period. Guidance on who may complete the MCCD when the modified Regulations are in force is available here. https://www.gov.uk/government/publications/guidance-notes-for-completing-a-medical-certificate-of-cause-of-death

Therefore, the duty to notify only applies where there is no medical practitioner who may complete the MCCD.

1. A registered medical practitioner means a person on the General Medical Council's list of Registered Medical Practitioners, who has a licence to practise.

2. It is anticipated that in practice, where available, it will be the medical practitioners who is qualified to complete the medical certificate cause of death (MCCD) who will be making the notification to the senior coroner.

3. A death may have already been reported to the coroner by a person other than a medical practitioner, such as a friend or family member of the deceased, or the police. Such reports will not usually include the information required at regulation 4(3) and (4), and may not provide the coroner with the full medical picture.

4. Therefore, even if a medical practitioner is aware that someone other than a medical practitioner has reported a death to the coroner, the registered medical practitioner should still make a notification under the Regulations.

Whilst Covid-19 is a notifiable disease under the Health Protection (Notification) Regulations 2010, a death caused by Covid-19 virus is not reason of its own to notify the death to the coroner.

Covid-19 is an acceptable direct or underlying cause of death

Circumstances in which a notification should be made under regulation 3

5. A death under the circumstances set out as follows should always be notified, regardless of how much time has passed since the death.

6. A death must be notified to the relevant senior coroner where there is reasonable cause to suspect that the death was due to (that is, more than minimally, negligibly or trivially) caused or contributed to by the following circumstances:

The death was due to poisoning including by an otherwise benign substance

7. This applies to deaths due to the deliberate or accidental intake of poison, including any substance that would otherwise be benign, beneficial or tolerable but at certain levels is injurious to health, such as sodium (salt).

8. In regard to alcohol or smoking related deaths, only those due to acute poisoning should be notified to the coroner. Deaths due to natural chronic/long lasting conditions (caused by alcohol or cigarette consumption) should not be notified to the coroner.

The death was due to exposure to, or contact with a toxic substance

9. This applies to any cases where death was due to the exposure to a toxic substance. Examples of this include, but are not limited to deaths due to:

    1) Toxic material, including toxic solids, liquids and gases.

    2) Radioactive material.

The death was due to the use of a medicinal product, the use of a controlled drug or psychoactive substance

10. This applies to deaths due to either the deliberate or accidental intake or administration of medicinal products or any other drugs, or any complications arising from this. Examples of this include, but are not limited to:
    1) Illicit, or recreational drugs.
    2) Medical drugs, including but not limited to, prescribed or non-prescribed medication (e.g. a self-administered overdose or an excessive dose given either in error or deliberately).

11. Any circumstance where the death may be due to a psychoactive substance should be notified to the coroner. A psychoactive substance includes any substance which is capable of producing a psychoactive effect in a person if, by stimulating or depressing the person's central nervous system, it affects the person's mental functioning or emotional state. Examples of this include, but are not limited to:
    1) New psychoactive substances, also known as 'legal highs' or 'designer drugs'.
    2) Herbal highs, such as salvia.

The death was due to violence, trauma or injury

12. A death may be considered due to violence, trauma or physical injury where, for example, the deceased:
    1) Died as the result of violence, trauma or injuries inflicted by someone else or by themselves.
    2) Died as the result of violence, trauma or injuries sustained in an accident, such as a fall or a road traffic collision.

The death was due to self-harm

13. This may apply if it is reasonable to suspect that the deceased died as the result of poisoning, trauma or injuries inflicted by his/herself or his/her actions.

The death was due to neglect, including self-neglect

14. Neglect applies if the deceased was in a dependent position (e.g. a minor, an elderly person, a person with a disability or serious illness) and it is reasonable to suspect that there was a failure to provide them with – or to procure for them – certain basic and obvious requirements. This would include, for example, a failure, omission or delay by any person to provide or procure:
    1) Adequate nourishment or liquid.
    2) Adequate shelter or warmth.
    3) Adequate medical assessment, care, or treatment.

15. This also includes a death, albeit from natural causes, where it is reasonable to suspect that the death results from some human failure, including any acts/omissions.

16. Self-neglect applies if the death is a result of the deceased intentionally or unintentionally not preserving their own life. However, this does not include circumstances where there has been a documented, reasonable and informed decision by the deceased not to act in a way that would have preserved their own life. This may include a decision not to take a certain course of treatment.

17. There may be cases where people fail to take adequate nourishment or proper personal care due to the natural progression of an underlying illness, such as dementia. Although this may hasten their death, this death should not be notified to the coroner unless there was neglect by others.

18. It does not extend to deaths where the lifestyle choices of the deceased – for example, to smoke, eat excessively, or to have a chronic alcohol condition – may have resulted in their death.

The death was due to a person undergoing any treatment or procedure of a medical or similar nature

19. This applies if the death may be related to surgical, diagnostic or therapeutic procedures and investigations, anaesthetics, nursing or any other kind of medical care. It includes scenarios such as:
    1) Death that occurs unexpectedly given the clinical condition of the deceased prior to receiving medical care.
    2) Errors made in the medical procedure or treatment e.g. the deceased was given an incorrect dosage of a drug.

3) The medical procedure or treatment may have either caused or contributed to death (as opposed to the injury/disease for which the deceased was being treated).
4) Death follows from a recognised complication of a procedure that has been given for an existing disease or condition.
5) The original diagnosis of a disease or condition was delayed or erroneous, leading to either the death or the acceleration of the death.

20. It should be noted that a death that has occurred following a medical or similar procedure may not necessarily be due to that treatment; the medical practitioner should consider whether there is a relationship. It is only in circumstances where the medical practitioner believes that the death was due to this procedure that the death should be notified.

The death was due to an injury or disease attributable to any employment held by the person during the person's lifetime

21. This includes injuries sustained in the course of employment (including self-employment, unpaid work, work experience or contracted services), for example if the death was due to a fall from scaffolding, or being crushed in machinery. It also includes deaths that may be due to diseases received in the course of employment even if the employment has long ceased.

22. Diseases in the course of employment made include, for example:
    a. A current or former coal miner who died of pneumoconiosis.
    b. A current or former furniture worker who died of cancer of the nasal sinuses.
    c. A current or former construction worker who died of asbestos-related lung- disease e.g. asbestosis or mesothelioma.
    d. A current or former rubber or paint worker who died of bladder cancer.

The person's death was unnatural but does not fall within any of the above circumstances

23. A death is typically considered to be unnatural if it has not resulted entirely from a naturally occurring disease process running its natural course, where nothing else is implicated. For example, this category includes scenarios in which the deceased may

have contracted a disease (e.g., mesothelioma) as a result of washing his/her partner's overalls which were covered in asbestos however long before the death occurred.

The cause of death is unknown

24. The duty to notify the coroner of unknown causes of death applies to an attending medical practitioner who is unable to determine the cause of death to the best of their knowledge and belief, based upon a conscientious appraisal of the known facts, including after suitable consultation with colleagues or a medical examiner.

The registered medical practitioner suspects that the person died while in custody or otherwise in state detention

25. This is relevant where the person was compulsorily detained by a public authority regardless of the cause of the death. This applies whether the custody or state detention was in England and Wales or elsewhere and includes:
    1) Hospitals, where the deceased was detained under mental health legislation (including instances when the deceased is on a period of formal leave).
    2) Prisons (including privately run prisons).
    3) Young Offender Institutions.
    4) Secure accommodation for young offenders.
    5) Secure accommodation under section 25 of the Children Act 1989.
    6) Any form of police custody e.g. the deceased was under arrest (anywhere) or detained in police cells.
    7) Immigration detention centres.
    8) Court cells.
    9) Cells at a tribunal hearing centre.
    10) Military detention.
    11) Bail hostel.
    12) When the deceased was a detainee who was being transported between two institutions.
    13) Any death in which the person would ordinarily have been in state detention but had been temporarily released (for example for medical treatment) or had absconded from detention.

26. This does not include circumstances where the death occurred while the deceased was subject to a Deprivation of Liberty Order unless the person was additionally subject to custody or detention as described at paragraph 25 above.

There was no attending registered medical practitioner, and there is no other registered medical practitioner to sign a medical certificate cause of death in relation to the deceased person

When the modified Regulations are in force, the death must be notified to the coroner if there is no attending medical practitioner who is required to sign the MCCD **and** there is no other medical practitioner who may sign the certificate within a reasonable time period.

The notifying medical practitioner will need to provide the coroner with relevant medical and supporting information.

Neither the attending medical practitioner, nor any other medical practitioner able to sign the medical certificate cause of death, is available within a reasonable time of the person's death to sign the certificate of cause of death

When the modified Regulations are in force if there is a medical practitioner who is able to sign the MCCD (either as the attending medical practitioner, or otherwise), but no such person is able to sign the certificate within a reasonable time period, then the death must be notified to the coroner.

It is ultimately for the discretion of a medical practitioner to determine what would be a 'reasonable time' based on the individual circumstances of the case. It is recommended that where there is a doctor able to complete the MCCD, they should be completing an MCCD as soon as possible.

It should be noted that a death must legally be registered within 5 days from the date of death, and the MCCD is needed for this registration to be made within this time limit. Therefore, completion of the MCCD should not exceed this time limit.

The identity of the deceased person is unknown

27. If the identity of the deceased is not known, then it follows that there will be no attending medical practitioner and/or the deceased's medical history is unknown, precluding the completion of an MCCD. In this scenario the death must be notified to the senior coroner.

28. Where the identity of the deceased is unknown it is recommended that the death is also reported to the police.

Information to be provided to the senior coroner

Information to be provided to the senior coroner

29. Regulation 4(1) requires the notification to the senior coroner to be made as soon as is reasonably practicable after the medical practitioner has determined that the death should be notified. While the regulations do not prescribe a specific time limit for notifications this notification should be prioritised. If the death arises from an event or occurrence that may be suspicious then the police should be informed immediately.

30. The medical practitioner should usually take reasonable steps to establish the cause of death before notifying the coroner. This may include seeking advice from another medical practitioner, such as a medical examiner or any other responsible consultant. However, where the death is clearly unnatural it may be more appropriate for a notification to be made to the senior coroner straight away.

Written Notifications

31. Notifications in writing include submission of documents by courier or electronically (including email, web portal or other scanning methods).

Oral Notifications

32. Regulation 4(2) allows a notification to be provided orally in exceptional circumstances. It is expected that medical practitioners will operate with IT systems which will facilitate the electronic transfer of information and records to the coroner, which includes the scanning of paper records and documents or the creation and transfer of electronically stored records and documents.

33. However, there may be circumstances or occasions where the IT infrastructure or systems required to facilitate the transfer of information, records and documents is not available in order for a timely written notification to be made to the coroner. Where the notifying medical practitioner does not have access to the facilities required to make a notification in written form you should inform the coroner of the reasons for this when making an oral notification.

34. Oral notifications may include notification by telephone.

35. Following an oral notification, the notifying medical practitioner must, as soon as is reasonably practicable provide a written notification, confirming the information given in the oral notification.

The Notification

36. Regulation 4(3) and 4(4) prescribes the information that a medical practitioner must, in so far as it is known to them, provide to a senior coroner when making a notification. If this information is not known to the medical practitioner, they do not have a duty to provide it as part of their notification.

37. Regulation 4(3)(c) requires the medical practitioner to provide to the coroner the name of the next of kin or, where there is none, the person responsible for the body of deceased. Where there is no identifiable person who may be responsible for the body, the medical practitioner should provide the name of the Local Authority who will be responsible for the disposal of the body.

38. Regulation 4(3)(d) requires that the medical practitioner indicate the reason why it is deemed that the death should be notified. The Regulations do not specify how this notification should be made and in certain circumstances it may be sufficient to refer simply to the sub-paragraph number within Regulation 3(1). However, it is expected that in most cases, the notifying medical practitioner will provide a detailed explanation of the likely cause of death in narrative form. Where possible, this should include the proposed medical cause of death and an explanation of any technical terms used.

39. Regulation 4(4) requires the medical practitioner to provide any further information that they consider to be relevant to the coroner. It is recommended that the medical practitioner making the notification provides their GMC number in this section. This provision allows for circumstances where a coroner requests medical practitioners to include information relevant to their investigation that is additional to that specifically listed within the Regulations.

40. A coroner's investigation may not be necessary in all notifiable cases. If the senior coroner is satisfied that he/she does not need to open an investigation then he/she may issue a 100A form, or refer the case back to the medical practitioner, who can issue a medical certificate of cause of death. For example, this might happen if the deceased was receiving palliative care at home, and this was documented in the general practitioner notes, but the general practitioner was unavailable at the time of notification. If this occurs, a clear record should be made in the patient notes by the medical practitioner who notified the death to the coroner, detailing the notification and subsequent re-referral back to the medical practitioner by the coroner.

Alternative format versions of this report are available on request from coroners@justice.gov.uk

Section 14: Glossary

AAU:

Acute Assessment Unit.

A&E / ED:

Accident and Emergency / Emergency Department.

AEC:

Ambulatory Emergency Care.

ATSP:

Acronym for 'asked to see patient'.

AZ:

Astra Zeneca.

British Expert Haematological Panel:

Comprises specialists in immunohaematology, haemostasis and thrombosis (or blood clotting and immune causes of reduced platelets), who held daily meetings between March and July 2021, to support clinicians managing these patients and learn from new cases. They are in regular communication with the regulators, other UK medical and surgical societies, multidisciplinary groups and international haematology colleagues focussed on this condition. They produced guidance on VITT.

Coronavirus (Covid-19):

An infectious disease caused by the SARS-CoV-2 virus.

Computerised Tomography (CT) cerebral venogram:

A type of CT scan where iodinated contrast medium is injected into the patient so that imaging of the dural venous sinuses within the skull can be obtained. It is the test of choice for the investigation of possible CVST in the emergency setting.

Covishield:

Trade name for coronavirus vaccine, manufactured by the Serum Institute of India (to an Oxford/ AstraZeneca formulation). Is a recombinant, replication-deficient chimpanzee adenovirus vector encoding the SARS-CoV-2 Spike (S) glycoprotein.

CUH:

Cambridge University Hospitals (NHS Foundation Trust) aka Addenbrooke's in this case.

CVST:

Cerebral venous sinus thrombosis. This is blood clot formation within the large venous channels within the skull.

Dabigatran:

Medication to help prevent blood clots; in a class of anticoagulant medications called direct thrombin inhibitors.

D Dimer:

A protein fragment (small piece) that's made when a blood clot dissolves in the body. A normal D-dimer is considered less than 0.50. A positive D-dimer is 0.50 or greater. Since this is a screening test, a positive D-Dimer is a positive screen.

Having a high D-dimer level in blood can be a sign of a blood clotting disorder since the level of D-dimer can rise greatly when there's significant formation and breakdown of blood clots in the body.

EVD:

External ventricular drain.

Firstnet:

IT system in use in WSFT where NHS 111 referrals (full call records) are placed after being electronically communicated via ITK (Interoperability toolkit).

Glasgow Coma Score (GCS):

GCS was described in 1974 by Graham Teasdale and Bryan Jennett (Assessment of coma and impaired consciousness. A practical scale. Lancet 1974; 2:81-4.) as a way to communicate about the level of consciousness of patients with an acute brain injury. The total score is obtained by adding the values for three motor activities – eye opening, best motor response, and best verbal response. Where the score is between 3 and 8 on the coma scale, emergency care is required immediately as a severe head injury is present. Those with scores of 9–11 are considered to have a moderate head injury, and those with a score of 12 or higher are considered to have a mild head injury.

Haematology:

Branch of medicine concerned with the study of the cause, prognosis, treatment and prevention of diseases related to blood.

Haemorrhage:

Bleeding.

Heparin:

Medication used to prevent or treat certain blood vessel, heart and lung conditions; also used to prevent blood clotting during heart surgery, in kidney dialysis and blood transfusions .

Homonymous hemianopia:

Visual field defect involving either the two right or the two left halves of the visual fields of both eyes

ICP:

Intra cranial pressure. Cranial relates to the bones that form the skull, intra refers to the space inside the skull.

Idarucizumab:

Medication, a specific reversal agent for dabigatran.

Immunoglobulin:

Also called antibodies; the most common type in the blood and other body fluids. Antibodies are proteins that the immune system makes to fight germs such as viruses and bacteria.

ITU:

Intensive Therapy Unit.

IV:

Intravenous.

JCVI:

Joint Committee on Vaccination and Immunisation - advises UK health departments on immunisation.

Methylprednisolone:

Medication, a corticosteroid used to treat inflammation or immune reactions across a variety of organ systems and endocrine conditions.

MHRA:

Medicines and Healthcare products Regulatory Agency - regulates medicines, medical devices and blood components for transfusion in the UK.

MRI:

Magnetic Resonance Imaging used in radiology to form pictures of the anatomy and physiological processes of the body. The scanner uses strong magnetic fields, magnetic field gradients and radio waves to generate images.

NHS 111:

A triage and signposting service for ‘urgent’ medical problems.

NHSE/I:

NHS England / Improvement - lead the National Health Service (NHS) in England. Configured

in seven regions who support local systems to provide more joined up and sustainable care for patients.

Regional teams are responsible for the quality, financial and operational performance of all NHS organisations in their region, drawing on the expertise and support of our corporate teams to improve services for patients and support local transformation.

NHS Digital:

NHS Digital teams design, develop and operate national IT and data services that support clinicians at work, help patients get the best care, and use data to improve treatment.

PF4 antibodies:

Platelet factor 4 is an amino acid protein, very abundant in platelets. Platelets (or thrombocytes) are small colourless cell fragments that form clots and stop or prevent bleeding.

PHE / The Green Book:

Public Health England, is an executive agency of the Department of Health and Social Care, established on 1 April 2013. It's website says that it exists to "protect and improve the nation's health and wellbeing and reducing health inequalities". On 1 October 2021, as part of the government's strategy to transform the public health system in England, responsibility for a number of public health functions transferred from Public Health England (PHE) to NHS England.

The Green Book is an online resource from Public Health England (PHE) and is regularly updated to reflect the latest evidence, guidance and recommendations on all vaccinations. The Green Book has a chapter on COVID-19 vaccination, which offers guidance on storage, dosage, priority groups and potential adverse effects.

Pinnacle/ Outcomes4Health:

National IT vaccination system. Outcomes4Health (previously known as Pinnacle) is a secure clinical service platform for healthcare, social care providers and commissioners to capture outcomes, locally and nationally.

Vaccination event data feeds back to GP systems and the National Immunisation Management System (NIMS).

Plasma exchange:

A procedure in which a machine is used to separate the plasma (the liquid part of the blood) from the blood cells.

PPG:

Patient Plus Group - provider of the NHS 111 service in this case.

SII:

Serum Institute of India.

SpR:

Specialist registrar.

Suffolk GP Federation:

Is a not-for-profit organisation (Community Interest Company) owned by 57 GP practices, covering 650,000 patients. Members remain independent organisations, whilst working together to develop local primary care.

SystmOne:

A clinical system where electronic health records are stored centrally. It allows staff to record and store patient information securely onto a computer.

Thrombocytopenia:

Low platelet count. Platelets are a blood component which have a role in clotting.

Thrombus:

A blood clot that forms inside one of your veins or arteries is called a thrombus.

Thrombosis:

Formation of blood clots.

Unity Healthcare:

Provided by Suffolk GP Federation who are responsible for its management. Located in Suffolk it provides a variety of Primary Medical Services from a number of locations to patients in designated catchment areas.

Vaccination:

The administration of a vaccine to help the immune system develop immunity from a disease. Vaccines contain a microorganism or virus in a weakened, live or killed state, or proteins or toxins from the organism. In stimulating the body's adaptive immunity, they help prevent sickness from an infectious disease. When a sufficiently large percentage of a population has been vaccinated, herd immunity results.

VITT:

Vaccine induced thrombotic thrombocytopenia.

Wards CUH / WSFT:

CUH -

- A2 - Neurosciences Critical Care Unit
- C8 - Neurology/Neurosurgery

WSFT -

- AAU - Acute Assessment Unit
- AEC - Ambulatory Emergency Care

- G8 - Stroke Unit

WSFT / WSH:

West Suffolk NHS Foundation Trust / West Suffolk Hospital, located in Bury St Edmunds.

Yellow Card Scheme:

The Yellow Card Scheme is run by the Medicines and Healthcare Products Regulatory Agency (MHRA). It collects, collates and investigates reports of suspected adverse drug reactions (ADRs). The scheme was set up in response to the thalidomide tragedy, which highlighted the urgent need for routine monitoring of the safety of medicines by a central body, independent of the pharmaceutical industry. It was the world's first spontaneous reporting scheme for the reporting of suspected adverse drug reactions and is the cornerstone of post marketing drug safety surveillance in the UK. The scheme is voluntary and relies on the identification and reporting of adverse drug reactions by health professionals and patients.

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