education

FROM THE JOURNALS Edited highlights of weekly research reviews on https://bit.ly/2PLtil8

Standing orders for naloxone in California

The number of opiate deaths in the US is increasing. States have adopted regulations regarding standing orders for naloxone, a medication to reverse opiate overdose. Under the standing order model, a doctor can prescribe naloxone to be distributed by trained health workers (such as pharmacists) to anyone who meets prescribed criteria for the drug. This study assesses how commonly naloxone is currently found in pharmacies in the state.

The study sent researchers with identical scripts to a representative sample of retail pharmacies asking whether they could receive naloxone without a doctor's prescription. Only 24% of pharmacies responded that they provided naloxone this way. Chain and urban pharmacies were more likely to furnish naloxone without a prescription. Only 50% of these pharmacies had nasal naloxone in stock.

JAMA doi:10.1001/jama.2018.12291

Naloxone at community pharmacy chains in Texas

Texas has no statewide regulation regarding standing orders, but several chain pharmacies there offer naloxone without prescription. In a study, 2317 chain pharmacies (all pharmacies of four major chains) in Texas were contacted by telephone asking about naloxone availability. Perhaps because only chain pharmacies were contacted, or because telephone rather than in-person data were collected, the availability was higher than in California: 84% indicated they would dispense naloxone without prescription, and 69% said they had it immediately available.

JAMA doi:10.1001/jama.2018.15892

Mortality and low quality universal health systems

The Global Burden of Disease study has given rise to a great number of publications. One quails from being too critical, but large claims require strong evidence.

The claim here: in low and middle income countries, universal health coverage can only improve health if there is good quality care. The authors use three different categories in attributions of morbidity and mortality: those which can be prevented by public health; those due to non-utilisation of healthcare; and those due to poor quality healthcare.

A cursory glance at the conditions illuminates the assumptions the study rests on. For example, one of the 61 conditions "for which personal health care plays an important role in reducing mortality" is "drug use disorders." It is an issue of some difficulty to decide whether drug use disorders are to be laid at the feet of public health, the health care system, or the individual.

Lancet doi:10.1016/S0140-6736(18)31668-4

A multicomponent exercise programme for older people in hospital

Hospitalisation can be disastrous for older, sick people. Part of the problem is lack of mobility in older patients, which often means they are allowed to "rest" in bed. Thus, I was cheered to read this randomised control trial, conducted in Spain, of a multicomponent exercise intervention among very ill older people in a geriatrics inpatient unit.

The intervention involved different kinds of exercises using various devices and surfaces. Whereas usual care involved normal visits from physical therapists, the intervention was provided twice daily. Was it the added time or the components of the intervention? Hard to know, but after five days, there was a substantial difference in function at discharge, as well as improvement in secondary outcomes like mood and mental status (though not delirium).

Does improvement on the measures used on discharge translate into less decline at home? Are these patients like mine—in their 80s, with an average of nine conditions? And would your local hospital be prepared to hire an additional physiotherapist?

JAMA Intern Med doi:10.1001/jamainternmed.2018.4869

Minimally invasive versus radical hysterectomy for cervical cancer

It has apparently been believed for a few years that minimally invasive surgery in women with early stage cervical cancer, ie, laparoscopic or robot assisted radical hysterectomy, is just as good as open surgery with an abdominal incision. However, this belief was based on retrospective trials and meta-analyses combining the findings of multiple such trials. This trial is prospective, designed to show the non-inferiority of minimally invasive surgery to open surgery.

It showed the opposite. Minimally invasive surgery was associated with lower overall survival and disease-free survival; the trial was stopped early after the difference in survival exceeded predefined limits for non-inferiority.

What next? While the authors' conclusions are appropriately couched in tactful language, and this is, after all, just one study, with the mechanisms of the difference as yet unknown, I wouldn't refer any patient of mine with early stage cervical cancer to minimally invasive surgery.

N Engl J Med doi:10.1056/NEJMoa1806395

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RATIONAL TESTING

Monitoring glycaemic control in patients with diabetes mellitus

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CPD READING 0.5 HOURS

LEARNING MODULE

See http://learning.bmj.com for linked learning module

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A 73 year old man with obesity and type 2 diabetes mellitus was referred to the diabetes clinic for advice. He had chronic kidney disease stage 3 and chronic anaemia from angiodysplasia of the small intestine. He was on insulin glargine 35 units every night and soluble human insulin 30 units three times daily before main meals. He was referred because of the discrepancy between his high fasting plasma glucose concentrations (16-21 mmol/L) and lower than expected haemoglobin A1c (HbA1c) concentration (49 mmol/mol) (expected with this fasting plasma glucose concentration ~108-140 mmol/mol or 12-15%). Table 1 gives glucose and HbA1c reference intervals. Other selected blood tests were: haemoglobin 106 g/L (reference interval: 125-180), ferritin 315 µg/L (reference interval: 24-250), creatinine 107 µmol/L (reference interval: 59-104), and albumin 32 g/L (reference interval: 35-50).

Table 1 | Reference interval for fasting glucose and HbA1c

	Reference interval (non-diabetic)	Diagnostic threshold for diabetes	Target*
Fasting plasma glucose concentration (mmol/L)*	4.1-5.6	≥7.0	4.0-7.0
HbA1c mmol/mol	42	48	<53
HbA1c %	<6.0	6.5	<7.0

*Target for adults on a drug associated with hypoglycaemia (NICE guideline NG28).

WHAT YOU NEED TO KNOW

- Be aware of the factors that give rise to a lower, or higher, than expected haemoglobin A1c (HbA1c)
- Discordant HbA1c and glucose results may identify underlying pathology such as a haemoglobinopathy, or occur as a result of anaemia or chronic kidney disease; discuss appropriate investigations with a clinical biochemist or diabetologist
- Alternatives to HbA1c for monitoring glycaemia in a patient include glucose profiling using quality assured glucose meters, fructosamine, glycated albumin, or total glycated haemoglobin
- Discuss with the patient ways to monitor treatment for diabetes, so that they are fully empowered to manage their condition

Diabetes mellitus diagnosed

↓

Monitoring glycaemic control

↓

Measure HbA1c
3-6 monthly tailored to individual needs (e.g. more frequent if acutely unwell) until HbA1c in acceptable range.
For type 1 DM may need to monitor HbA1c more often if blood glucose levels fluctuates markedly.
Then, 6-12 monthly once HbA1c and therapy stabilised.

↓

Discordant or unexpected HbA1c and glucose result

↓

Repeat HbA1c testing to exclude random error.

↓

If there is evidence of microcytic anaemia or clinical evidence or family history of haemoglobinopathy consider **haemoglobin electrophoresis and/or genetic studies**.

↓

HbA1c unreliable
Consider:
Fructosamine or glycated albumin
Total glycated haemoglobin
Quality controlled blood glucose profile

Quality controlled plasma glucose profile
Alternative Tests:
Self monitoring of blood glucose at least 4 times a day (7-10 times may be necessary in some cases e.g., continuous subcutaneous insulin infusion therapy or when acutely unwell).

There are no specific recommendations regarding fructosamine, glycated albumin or total glycated haemoglobin but it is anticipated that this will vary between 3-6 months dependent on individual circumstances.

SPL

Table 2 | Key tests: using blood glucose or HbA1c concentrations for monitoring diabetes mellitus[3-6]

Measure	Advantages	Disadvantages
Blood glucose	Low cost Widely available Amenable to point-of-care testing	May require fasting Instability in blood collection bottles Only reflects hyperglycaemia at the time of sampling Large biological variability Increased in acute illness Lack of global standardisation of plasma glucose Develops late in type 2 diabetes, potentially delaying diagnosis and treatment
HbA1c	Fasting not required Low biological variability Marker of long term glycaemia over average lifespan of red blood cells (~120 days) Stable during acute illnesses Good sample stability in blood collection bottles reduces concerns with delay in analysis Assays are now standardised, allowing comparisons between laboratories Blood levels correlate with complications related to diabetes, such as cardiovascular disease	See box

Disadvantages of HbA1c for monitoring diabetes[4-8]

Factors that decrease HbA1c

- Decreased average red blood cell age: haemolytic anaemia (because of congenital conditions, immunological causes, drug related, liver disease, splenomegaly); reticulocytosis (because of haemolytic anaemia, erythropoietin therapy, or haemorrhage)
- Chronic kidney disease owing to shortened lifespan of red blood cells (partly owing to renal anaemia and/or erythropoietin deficiency).
- HIV infection as a direct effect of using nucleoside reverse transcriptase inhibitors, possibly as a result of red blood cell destruction.
- Decreased glycation: high dose vitamins C and E, alcohol, some antiviral drugs (eg, ribavirin), or antibiotics (eg, trimethoprim-cotrixamole).

Factors that increase HbA1c

- Increased mean age of red blood cells: resulting from splenectomy; decreased percentage of reticulocytes, for example in aplastic anaemia

What is the next investigation?

Monitoring diabetes mellitus

The diagnosis of diabetes mellitus is well described[1-4]; however, the monitoring of diabetes with HbA1c (which is common practice) has introduced some uncertainty. Glycaemic control is integral to effective treatment of diabetes.[1 2] HbA1c concentration is used as the biomarker for long term glycaemic control as it correlates well with average blood glucose levels over a period of 90-120 days before measurement.[3 4] It is recommended that all patients with diabetes on insulin therapy, and select patients on non-insulin therapies, are monitored by their glucose concentration (see figure, p326) for planning appropriate individualised therapeutic strategies with active patient involvement.[5] Guidelines from the American Diabetes Association and the European Association for the Study of Diabetes[5] recommend combining this with periodic (twice a year on those meeting targets; quarterly in those whose treatment has been changed or who are not meeting targets) HbA1c testing for effective management and risk stratification of patients with complications of diabetes. However, there are circumstances when HbA1c alongside glucose testing becomes unreliable for monitoring patients with diabetes. It is not clear how prevalent this situation is, but is likely to be present in geographical regions such as South East Asia and some parts of Africa where haemoglobinopathies are common.

What affects the accuracy of HbA1c and glucose measurements?

When plasma proteins, including haemoglobin, are exposed to glucose they are glycated.[6] The degree of glycation usually depends on the plasma glucose concentration. Red blood cells have an average lifespan of 120 days, therefore measuring HbA1c gives an estimate of blood glucose concentration over that period.

Glucose is measured by methods that use enzymes in reactions involving either generation of an electric current or formation of a coloured product in a proportional manner.[7] The advantages and disadvantages of monitoring blood glucose are listed in table 2. By contrast, clinical laboratories use methods such as ion exchange chromatography, capillary electrophoresis, immunoassays, enzymatic assays, and mass spectroscopy to measure HbA1c.[8] There are advantages to using HbA1c (table 2), but where the patient has haemoglobinopathies, haemoglobin variants, and factors that increase or decrease HbA1c concentration (box), these can cause variations in the results. The UK's National Institute for Health and Care Excellence (NICE) guideline NG28 recommends that clinicians liaise with clinical biochemists or diabetes specialists if they detect unexplained discrepancies or discordant HbA1c and blood glucose measurements.[9]

What is the next investigation when a discordant HbA1c and glucose result is observed?

There is some linear relationship between HbA1c and estimated average glucose over the lifespan of red blood cells (120 days), however, recent (ie, 3-4 weeks earlier) plasma glucose levels contribute relatively more to the final plasma HbA1c concentration.[10] Therefore, in situations where there are abrupt changes in glycaemia or rapid turnover of red blood cells, such as in chronic kidney disease and anaemia, using HbA1c to monitor patients may give unexpected results. When there is an apparent discordance between glucose and HbA1c, re-testing can exclude a random test error.[11] Occasionally these discordant results might reveal the presence of an analytical interference, presence of haemoglobin variant, or haemoglobinopathy.[12] If there is evidence of microcytic anaemia, clinical evidence of haemoglobinopathy or family history of the same, haemoglobin electrophoresis, and/or genetic studies are suggested (figure).[13] Clinical laboratories that measure HbA1c will have procedures in place to deal with haemoglobin variants or haemoglobinopathy detected during analyses. As different methods and analysers are affected differently by haemoglobin variants, if a variant is suspected it might be necessary to use an alternative method not prone to interferences. It has been suggested that, in geographical areas where there is a large prevalence of a specific variant(s), methods that are less affected by those variants should be used, but such decisions have economic implications.[14]

How to monitor patients with diabetes when HbA1c is unsuitable?

In situations where HbA1c is not suitable to monitor patients with diabetes, as in the presented case or in situations listed in the box above, alternatives to consider include glucose profiling using quality assured devices, total glycated haemoglobin, fructosamine, or glycated albumin (table 3).[15] NICE guideline NG28 recommends total glycated haemoglobin, fructosamine, and glucose profiling for monitoring when HbA1c is unreliable (figure).[9] Currently, costs, inadequate assay standardisation, and lack of consensus about specific treatment targets are hampering the widespread use of these alternative tests.

Table 3 | Alternative tests for monitoring glycaemic control in patients with diabetes[12-15]

Test	Description	Advantages	Disadvantages	Reference interval (RI)
Quality assured blood glucose profile	Measurement of blood glucose using quality assured glucose meters. It may be undertaken by the patient at home	Empowers patient to self-manage condition. Results available in real time. Allows for immediate corrective actions.	Glucose meters have to be maintained and quality controlled. May give erroneous results if instructions for use not followed	4.1-5.6 mmol/L
Fructosamine	Measures all glycated proteins including albumin in plasma	Useful in conditions where HbA1c is not suitable. Age, gender, and race-based reference intervals now available	As albumin has a shorter half life of 20 days, the past profile of glycaemia obtained is shorter than with HbA1c. Assays are not standardised, so results cannot be directly compared. Falsely low results are seen with decreased serum total protein and/or albumin. Iron deficiency anaemia will give falsely higher results as a result of enhanced glycation	Assay, age, gender, and race dependent. Overall RI: 194.8- 258.0 µmol/L[15]
Glycated albumin	Specifically measures glycated albumin expressed as a percentage of total serum albumin	As for fructosamine	As for fructosamine. Assays not yet widely available	Assay, age, gender, and race dependent. Overall RI: 10.7- 15.1%.[15]
Total glycated haemoglobin	Measures HbA1c based on the separation of proteins resulting from structural differences. The method uses boronate, which reacts specifically with glucose bound to haemoglobin (boronate-affinity chromatography)	Shows the least analytical interference from the presence of haemoglobin variants. Has good assay precision. Available on point-of-care devices	May be affected by abnormal glycation of proteins. Measures all total glycated haemoglobins, which includes HbA1c. Therefore, the user is unable to discern the presence of haemoglobin variants, if present	20-42 mmol/mol (International Federation of Clinical Chemistry, IFCC) or 4-6% (National Glycohemoglobin Standardization program, NGSP)

HOW PATIENTS WERE INVOLVED IN THE CREATION OF THIS ARTICLE

The idea for this manuscript came from discussions with general practitioners and their patients regarding either discordant or unexpected HbA1c and blood glucose results. We took the case discussed here as an example. We discussed the plan of future monitoring and management with the patient and gave him knowledge about his specific situation of rapid red blood cell turnover that resulted in unreliable HbA1c concentration. We discussed the importance of glucose monitoring and fructosamine testing for his diabetes self-management. He was happy about using his case scenario to educate other patients and healthcare professionals. Although the contents of the article were discussed with him, he did not make comments to modify the paper

EDUCATION INTO PRACTICE

- How might your approach to monitoring patients with diabetes and haemoglobinopathies, anaemia, or chronic kidney disease change as a result of reading this article?
- How often have your patients with diabetes had HbA1c results that were unexpected or appeared discordant with the measured glucose concentration?
- When and how might you contact specialists such as clinical biochemists or diabetes specialists for assistance with interpreting HbA1c results or seek advice on further investigations?

Outcome

The patient was re-tested with a fructosamine assay, which gave a concentration of 564 µmol/L (reference interval 215-310). HbA1c concentration was 54 mmol/mol and haemoglobin concentration 105 g/L. HbA1c of 48 mmol/mol or 6.5% approximately equates to fructosamine of 270.2 µmol/L.[15] The relatively low HbA1c was related to low haemoglobin and rapid turnover of red blood cells owing to gastrointestinal blood loss and consequently accelerated erythropoiesis.

The patient agreed to undertake glucose self monitoring and fructosamine measurements every four months. He was advised to increase insulin doses gradually, attempting to keep pre-meal glucose concentrations at an individualised target level of 7-9 mmol/L.[9] When reviewed at the diabetes clinic four months later, his blood glucose concentration was in the range 8-12 mmol/L, and fructosamine was 384 µmol/L (reference interval 215–310) without hypoglycaemic episodes while he was on insulin glargine 50 units per night and soluble human insulin 40 units before main meals—a diabetes control acceptable for his age and associated comorbidities.

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WHAT YOUR PATIENT IS THINKING

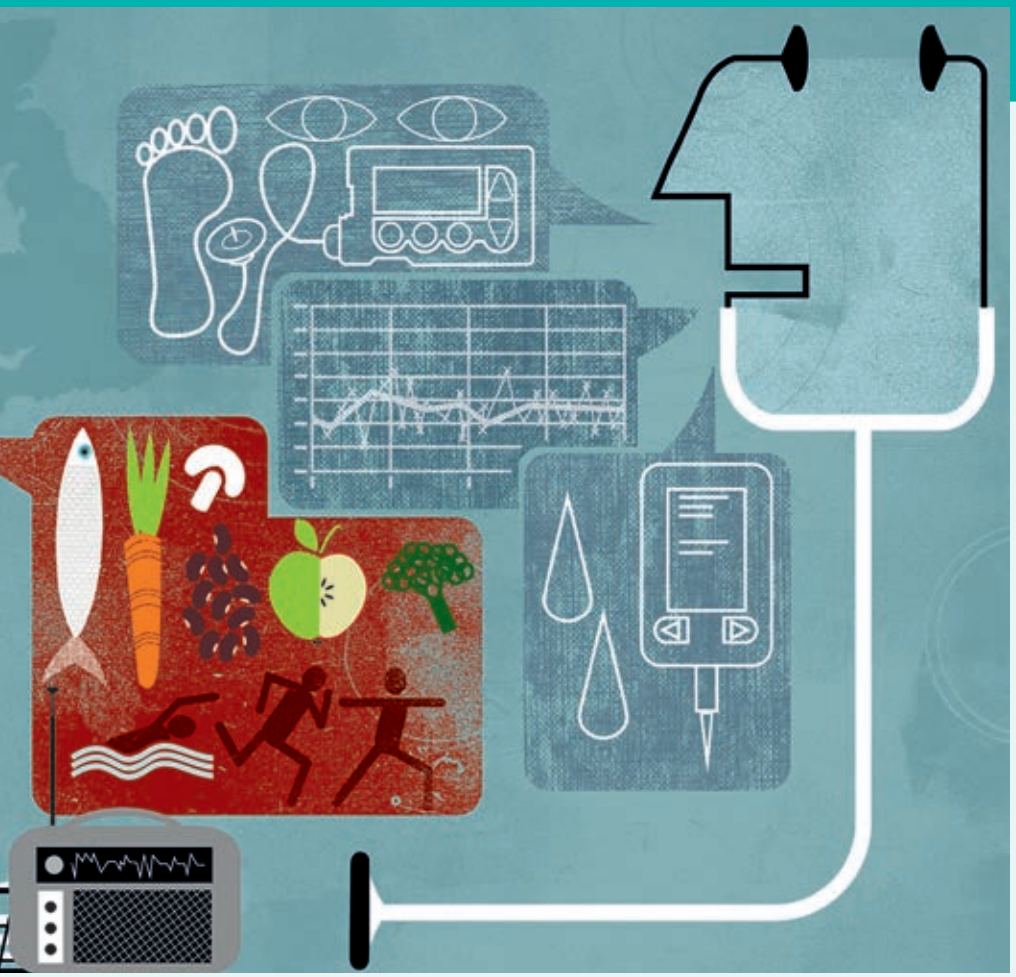
Are you well controlled?

Why the way you talk to me about my condition is important, says **Judith Hendley**

CPD READING 0.5 HOURS

WHAT YOU NEED TO KNOW

- Listen to the language patients use and try to reflect it back to them in your observations or questions
- Take the time to find out what matters to your patients—the things that they are worrying about might not be obvious to you
- Think about the language you use when you are referring to or writing about people with diabetes or other long term conditions—would they find the language you have used empowering or disempowering?



ROSE LLOYD

I have type 1 diabetes. I'm also a mum, a northerner who has made my home in south east London, a health policy geek, and an avid Radio 4 listener. So it troubles me to be referred to as a "diabetic" or for people with diabetes in general to be called "diabetics." Although this does not bother everyone, I feel this reduces me to being someone with diabetes and nothing more.

Being identified by my condition

Since developing type 1 diabetes as an adult I have realised that once you have a long term condition there are certain things you can come to expect. One is always to be referred to as a patient, regardless of what role you are in at the time. Another is that you are no longer allowed to belong in the category of people described as healthy, however well you feel in yourself and however active you are. It's as though at the point of diagnosis you pass over an invisible line and are never allowed to cross back.

I would like to be identified as a person first and not as a "diabetic patient." This means not having assumptions made about me or about what might be important to me because of my condition and not making one of the first questions I'm asked my most recent HbA_{1c} result.

The language used can make a big difference to how I feel about having a long term condition

The power of language

I've always been interested in the meaning and interpretation of words and language. Language can convey meaning, and shape understanding. It can stigmatise and label or it can empower and affirm. The language used by healthcare professionals, the media, and others can make a big difference to how I feel about having a long term condition.

It's important to me to think that I can determine how I integrate diabetes into my life. Living with type 1 diabetes requires mental agility combined with resilience, stamina, perspective, and a healthy sense of humour, so state of mind is everything and language plays a big part in that.

I am supported by fantastic NHS diabetes specialists who are committed to helping me to achieve my goals and who also understand that diabetes isn't the only thing going on in my life. But I have also found that some healthcare professionals with less experience in diabetes can sometimes struggle to find the right language to talk to me about it. For example, I can be asked, "Do you suffer from diabetes?" This makes me feel as though the person asking the question perhaps perceives me as the passive victim of my condition. It is hard to be passive with diabetes, and I "suffer" far more when I have a cold. (It might be better just to ask—"Do you have diabetes?")

Being "well controlled"

I'm also sometimes asked if I am "well controlled?" I find this question difficult because it feels like a question about my behaviour and how "good" I have been. Whenever I'm asked the "control" question, a part of me wants to reply, "No, in fact you just can't take me anywhere." It can also make me question if the person asking has an understanding of the difficulties in achieving a consistent equilibrium with type 1 diabetes and what the trade-offs can be. I'd prefer to be asked questions like, "How are things going with your diabetes?", "Are you having any difficulties with your blood sugar at the moment?", or "Is there anything that you're finding particularly challenging?"

Open questions

In general, any kind of open question that allows me to feel understood and supported and not judged for the choices I make about how I manage my condition is more helpful. For example, "How are you feeling about your diabetes at the moment?", "What is most important to you right now?", or "What ideas have you thought about for how you could handle that?"

It may seem overly precious to be so concerned about language in the overall scheme of things. However, as a healthcare professional, reflecting on and reframing the language you use while still making sure you get the information you need could make a big difference to how the people in front of you see themselves and their condition—and how they see you.

EDUCATION INTO PRACTICE

- What other examples of conditions or situations might this topic of language also be important to?
- When quantifiable biomarkers are part of condition management, how else could you talk about them?
- How might you get feedback from patients on the language you use?
- How could you change the language you use to empower and support patients with long term conditions to achieve their goals?

These questions were developed by the editors and reviewed by the patient author

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ESSENTIALS

Managing chest drains on medical wards

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LEARNING MODULE

See http://learning.bmj.com for linked learning module

CPD READING

0.5 HOURS

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This article aims to provide a robust overview for non-specialists of how to manage a chest drain in the acute setting once it has been inserted.

Managing chest drains on medical wards is a common clinical problem. Pleural disease affects up to 3000 people per million of the population annually in the UK,[1] with a substantial number requiring acute pleural intervention in an acute hospital. A national audit in 2010 of 58 acute hospitals in the UK revealed an average of just over seven chest drain insertions per hospital per month. These procedures are increasingly performed by respiratory specialists and radiologists, so the clinician inserting the drain is often not subsequently responsible for the day-to-day management of the patient.

HOW PATIENTS WERE INVOLVED IN THE CREATION OF THIS ARTICLE

No patients were involved in the creation of this article

Box 1 | Common indications for intercostal chest drain insertion

- Pneumothorax
  - Tension pneumothorax (after needle decompression)
  - Persistent or recurrent after pleural aspiration
  - Large secondary pneumothorax in patients >50 years
- Pleural effusion
  - Malignant effusion with or without pleurodesis
  - Large parapneumonic effusion
  - Empyema
- Traumatic haemopneumothorax
- Post-surgical
  - Thoracotomy, oesophagectomy, cardiac surgery

WHAT YOU NEED TO KNOW

- Request a chest x ray immediately after chest drain insertion to check for position and immediate complications
- When draining a pneumothorax, if there is no swinging or bubbling in the chest drain check whether it is blocked or displaced; when draining a pleural effusion, monitor output and drain no more than 1.5 litres at a time
- Patients with chest drains require daily review—but the patients are often best placed to tell you if the drain is still working

When are intercostal chest drains used?

The commonest indications encountered in an acute inpatient hospital setting are pneumothorax and pleural effusion (see box 1, left). Out of normal working hours, drain insertion is performed only in emergency situations (such as tension pneumothorax, pneumothorax, or effusion with respiratory compromise or empyema). Furthermore, in the case of large pleural effusions with respiratory compromise that present out of hours, a therapeutic aspiration (removing up to 1.5 L of fluid) is preferred if you are not sufficiently experienced with drain insertion as complication rates are lower.[2]

Increasing evidence shows that the use of real-time thoracic ultrasound guidance for pleural aspiration or chest drain insertion is associated with lower complication rates.[2] In response, British Thoracic Society (BTS) guidelines necessitate the use of real-time thoracic ultrasonography when inserting a chest drain.[2]

Chronic use of chest drains

Occasionally people have longer term chest drains—such as for persistent malignant effusions—and rarely patients may be discharged with a chest drain in situ.

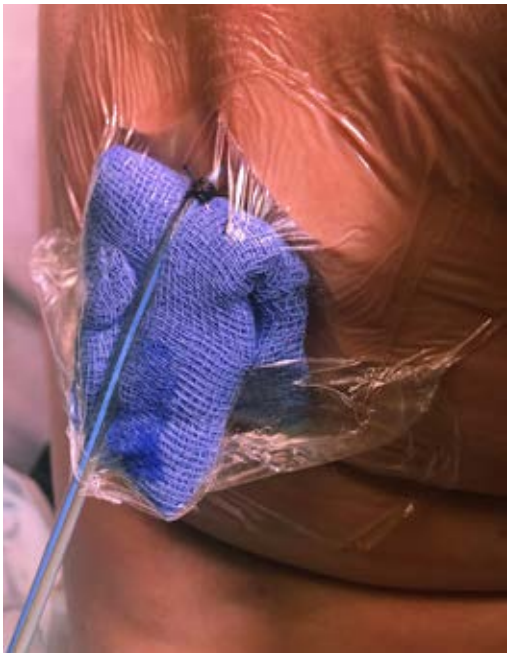

Fig 1 | One suggested method of dressing a chest drain. A folded gauze swab absorbs any fluid leak, protects the drain from kinking, and the skin from pressure. The two biocclusive dressings (one from the top, the other "sandwiching" the drain from the bottom) allow the wound to be visible, and if the drain is accidentally pulled, provide a wide surface area of resistance, avoiding reliance on the suture to keep the drain in place

Box 2 | Chest x ray findings after chest drain insertion

Ideal placement

Pneumothorax—Apical placement

Pleural effusion—Basal placement

Complication

Pneumothorax—No action required as long as the drain is patent

Drain kinked or inserted too deep—Withdraw drain to the required length, re-suture, and repeat the chest radiograph

Drain subcutaneous or not inserted to a sufficient depth—Remove and discard chest drain. Repeat chest drain insertion with new kit. Do not insert current drain further as this risks contaminating the pleural space

Subcutaneous emphysema—Usually self limiting, see specific management below

Haemothorax (increasing volume of effusion)—See specific management below

Fig 2 | "Swinging" of water column in chest drain tube during breathing cycle reflects expiration (left) and inspiration (right)

The drain is in, what now?

Chest radiograph—After drain insertion, immediately request a chest radiograph for all patients to ensure adequate drain position and assess for complications (see box 2).

Position—Attach the drainage bottle to an underwater seal and instruct the patient to ensure the bottle remains below the level of his or her waist at all times to avoid retrograde flow of drain contents into the pleural space.

Pain relief—Offer pre-emptive analgesia before drain insertion. Ensure all patients have adequate analgesia prescribed after drain insertion, as pain often increases as local anaesthetic wears off. Warn patients of this and encourage pre-emptive analgesia. Prescribe "as required" opiate analgesia (such as codeine phosphate plus liquid morphine sulphate, dosed according to patient requirements) and offer regular opiates should pain continue.

Dressings—Standard dressings (such as Tegaderm) often suffice with adequate gauze used as padding under the drain site. Use a clear dressing so that the insertion site is visible without removing the dressing (fig 1). Monitor drain site daily for dressing soiling and signs of infection. Skin allergies to dressings are not uncommon.

Drain plan—One of the most important aspects of drain management is to have a documented and verbally communicated drain plan. In the plan, provide specific instructions regarding:

- When to clamp the drain (to avoid re-expansion pulmonary oedema in pleural effusion)
- Whether drain flushes are required.

Review patients who have a chest drain in situ at least once daily (including weekends) to ensure that the drain remains in place and is patent, and that the drainage plan is being followed.

What to observe about a chest drain?

"Swinging" and bubbling

A chest drain placed into the pleural space acts as a window into the mechanics of respiration. In normal circumstances, the water column in the drainage bottle or tubing will move during the respiratory cycle, so called swinging (fig 2). During inspiration, the normal negative intrathoracic pressure generated is approximately −8 cm of water.[8] As such, the drain content will be drawn back towards the patient, whereas during expiration this is reversed, giving the characteristic "swinging" appearance.

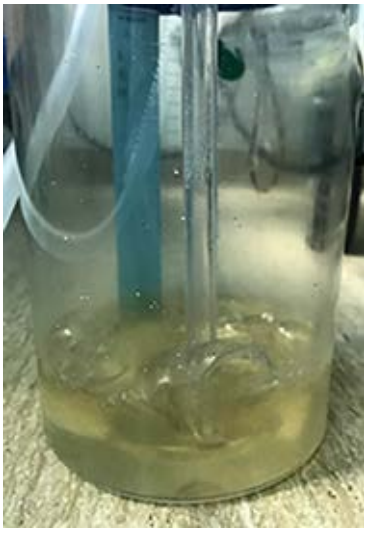

Fig 3 | A chest drain for pneumothorax will initially bubble spontaneously, as the intrathoracic pressure forces air out of the pleural space

A sequence of drain behaviours is expected depending on whether the drain is placed for removal of fluid or air:

Air—The drain will initially bubble spontaneously, as the increased intrathoracic pressure caused by the pneumothorax forces air out of the pleural space (fig 3). As this pressure reduces, bubbling will only occur on coughing. As the pneumothorax resolves, bubbling will stop altogether, and the drain will only "swing."

Fluid—The drain will initially drain the effusion quickly due to the increased intrathoracic pressure caused by the pleural effusion. This will be evident in the drainage tube and will often quickly begin to fill the drainage bottle. As the pressure reduces, the flow will reduce and a "swing" will be visible. A swinging drain does not indicate that the whole effusion has been drained, just that the initial pressure has reduced.

Drain output

Document the drain output and presence of bubbling—usually nurses will be recording this every 1-4 hours. Patients are often best placed to inform you if or how much the drain has been bubbling or draining. Monitor patients closely for symptoms of breathlessness, cough, and chest pain and whether drain clamping may be required before 1.5 L of fluid has been drained. No more than 1.5 L should be drained in one go.

What problems can occur?

Post-drain insertion emergencies are not common but can be severe. Always seek senior or specialist input if uncertain.

The patient is coughing and is suddenly short of breath (re-expansion pulmonary oedema)

When draining large effusions, be wary of re-expansion pulmonary oedema, caused by rapid re-expansion of lung parenchyma and subsequent reinstatement of normal intrapulmonary blood flow into previously compressed vessels. This tends to arise immediately after chest drain insertion due to overly rapid drainage of pleural effusions. Clinically this manifests with shortness of breath and severe coughing with reduced oxygen saturations. A chest radiograph may show evidence of alveolar shadowing. If this occurs, the drain must be clamped immediately, and symptoms will then normally resolve. If the condition does not improve then institute supportive measures, including supplemental oxygen and, in extreme cases, ventilatory support.

The drain has stopped bubbling or swinging and the patient is short of breath (drain blockage)

If the drain is neither swinging or bubbling, the drain is either blocked (and so cannot reflect the transpleural pressures) or is displaced. Drain blockage usually occurs in the days after chest drain insertion and is caused by fibrin clots, blood, or simply by having its drainage holes occluded by the chest wall.

Inspect the drain to ensure it is not kinked or displaced and perform simple drain flushes with 10 mL of 0.9% saline, both into the chest and into the drainage system. If this is performed easily and the blockage does not resolve then consider imaging to assess drain position and need for re-insertion.

In the case of pneumothoraces, a blockage manifests as a clinically worsening pneumothorax or tension pneumothorax.

The drain is draining blood (haemothorax)

Haemothorax is a rare complication of chest drain insertion, and spontaneous haemopneumothorax is even less common. If blood drains from the chest, it is important to seek senior specialist advice quickly. Take initial steps to ensure the patient is haemodynamically stable. Reverse any identified coagulopathy and give blood products as required. After this, urgent cross sectional imaging and discussion with interventional radiology and cardiothoracic surgeons is required.

Heavily bloodstained effusions are common, particularly in the presence of malignant pleural disease. To differentiate blood staining from a true haemothorax, run a sample of pleural fluid through a blood-gas analyser, and the haemoglobin concentration can provide supporting evidence for a haemothorax.

The drain has stopped working and the patient is swelling up (subcutaneous emphysema)

Subcutaneous (or surgical) emphysema is a potential complication after chest drain insertion and can occur immediately or in the days after drain insertion. This tends to affect the subcutaneous tissue surrounding the drain only, but if severe it can also affect the rest of the thorax, abdomen, neck, arms, and even the face. It is normally self limiting and resolves spontaneously, but rarely it can cause airway or haemodynamic compromise because of compression of structures within the neck.[9] Treatment is not normally required, but case reports have described the need for subcutaneous drain insertion to treat severe cases.[10 11]

When should a chest drain be removed?

Pneumothorax

Once the chest drain has ceased bubbling, either the lung has re-expanded fully or the drain is blocked. If the drain has stopped bubbling but is still swinging, this implies lung re-expansion with ongoing drain patency. If the drain is not swinging or bubbling, drain blockage may have occurred. To determine which, request a chest radiograph for any patient with a drain that has stopped bubbling. If this shows complete lung re-expansion, the drain can be removed.

If after 48 hours there is an ongoing air leak and incomplete lung re-expansion, refer for review from the local specialist respiratory team. High-volume low-pressure suction systems are often used, despite minimal evidence supporting their use.[12] If air leak continues despite suction, refer to thoracic surgery for a surgical pleurodesis or pleurectomy.

Pleural effusion

Once the daily drain output falls below 100 mL (which equates to the estimated physiological pleural fluid production[13]), perform a repeat chest radiograph or thoracic ultrasound scan to assess for resolution of the effusion. If there has been satisfactory resolution, the drain can be removed.

How to remove a chest drain?

Removal of a standard Seldinger drain can be performed by medical or experienced nursing staff. Remove all dressings and stitches first to avoid tugging the skin during drain removal. Remove the drain in a smooth but quick manner in expiration and apply an airtight dressing immediately. Only large bore drains (≥18 Ch) require stitching after removal.

Once the drain has been removed, the patient must undergo a chest radiograph to ensure there has been no entrained air during drain removal and, in the case of pneumothorax, that the lung has remained fully expanded. The radiograph is usually performed some hours after removal.

Competing interests: *The BMJ* judged that there were no relevant financial interests. The authors have read and understood BMJ policy on declaration of interests and have no relevant interests to declare.

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EDUCATION INTO PRACTICE

- Do you routinely use thoracic ultrasound for all pleural procedures?
- Do all your chest drain patients have a clearly documented post-insertion plan?
- How do you ensure this plan is clearly communicated to other healthcare professionals involved in the patients care?

SPOT DIAGNOSIS

A tired young man with a dysmorphic thumb

A 23 year old man with short stature, congenital malformation of the left thumb and both ears, and a single kidney presented with back pain, shortness of breath, fatigue, and easy bruising that had developed over several months. Physical examination revealed hepatosplenomegaly.

His brother had died in early childhood, more than 20 years ago. The patient's parents reported that his brother, "had similar but worse congenital malformations, including bad kidney problems."

Full blood count showed pancytopaenia, which prompted further laboratory investigations (table).

Radiography of the patient's left hand (figure) revealed a single fused phalanx, anomalous carpal bones, and a hypoplastic radial styloid.

Computed tomography imaging of the patient's neck showed partially fused cervical vertebrae and dysplastic ear healing after surgical reconstruction.

What is the most likely diagnosis?

Submitted by Grzegorz Nalepa

Patient consent obtained.

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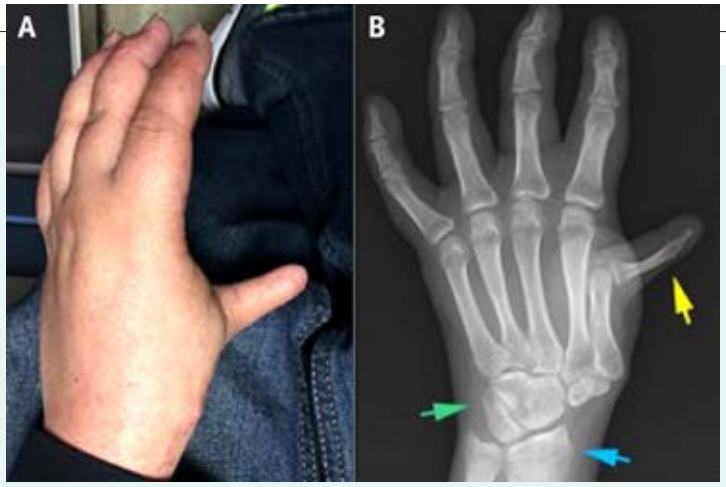

(A) Dysmorphic left thumb. (B) Radiograph of left hand showing single fused phalanx (yellow arrow), anomalous carpal bones (green arrow), and a hypoplastic radial styloid (blue arrow)

Initial laboratory investigations

Test	Result	Normal range
White blood cell count [k/mm^3]	2.6	3.6-10.6
Haemoglobin [g/dL]	6.2	13.4-17
Haematocrit [%]	18.4	40-54
Red blood cell mean corpuscular volume [fL]	104	81-99
Red blood cell distribution width [%]	24.1	11.5-14.5
Platelets [k/mm^3]	143	150-450
Absolute neutrophil count [k/mm^3]	1.508	1.7-7
Absolute lymphocyte count [k/mm^3]	0.806	1-3.2
Promyelocytes [k/mm^3]	0	26
Macrocytes	Moderate	None
White blood cell morphology	Hypogranulated	Normal

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answers

For extra material, including patient outcome, go to bmj.com/endgames

SPOT DIAGNOSIS **A tired young man with a dysmorphic thumb**

The most likely diagnosis is acute myeloid leukaemia secondary to Fanconi anaemia. Pancytopaenia in patients with congenital abnormalities is suggestive of inherited bone marrow failure syndromes, such as Fanconi anaemia, dyskeratosis congenita, or Shwachman-Diamond syndrome.[1]

Thumb and radial anomalies (figure) are hallmarks of Fanconi anaemia, and ear abnormalities affect one in five people with the condition. This patient's deformities are typical of Fanconi anaemia, but a lack of deformities does not exclude this syndrome: one in three individuals with Fanconi anaemia has no deformity.

Fanconi anaemia increases a person's risk of developing myelodysplasia and acute myeloid leukaemia by over 300-fold in pre-teenage years and young adulthood.[2]

In this patient, the recent back pain and pancytopaenia is likely caused by expanding abnormal haematopoiesis in the bone marrow rather than his vertebral abnormalities. This, along with the history of fatigue and bruising, is sufficient to raise suspicion of acute myeloid leukaemia/myelodysplastic syndromes and trigger further investigations, including bone marrow aspirate evaluation.

Patient outcome

The patient's bone marrow evaluation showed myelodysplasia with 23% blasts and complex cytogenetic abnormalities. Chromosome breakage test coupled with gene sequencing confirmed Fanconi anaemia. His pain was caused by myelodysplasia evolving into acute myeloid leukaemia. He died from progressive disease before potentially life saving haematopoietic stem cell transplantation could be pursued.

Learning points

Early diagnosis of Fanconi anaemia reduces the risk of malignancies and complications (eg, life threatening bone marrow failure). This is because patients remain under multidisciplinary expert surveillance throughout their lives.

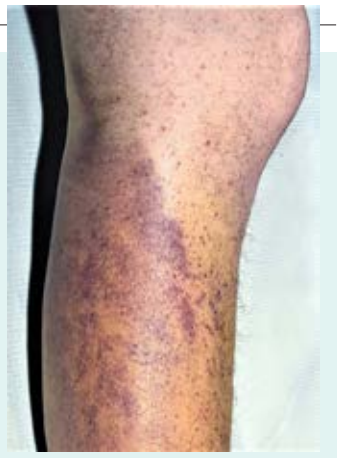
CPD READING
0.5 HOURS

You can record CPD points for reading any article. We suggest half an hour to read and reflect on each.

LEARNING MODULE

Articles with a "learning module" logo have a linked BMJ Learning module at http://learning.bmj.com.

Lethargy, rash, and bruising



A 58 year old man presented with fatigue and perifollicular haemorrhages, bruises, and corkscrew-hairs on his legs (right). His diet was meat based, with little intake of fruit or vegetables. There were no features of malabsorption.

Scurvy was diagnosed on clinical grounds. The fatigue improved within three days of starting oral ascorbic acid, and the skin changes resolved within seven days. Investigations revealed coexisting iron deficiency.

Risk factors for scurvy include diets low in fruit and vegetables, chronic illness, alcoholism, and old age. Clinical signs may appear within 2-4 months of a diet devoid of vitamin C. Deficiencies of iron, zinc, vitamin B_{12}, folate, and calcium may coexist.

Anupama Nair; Indrajit Chattopadhyay (indra_chatterjee@aol.co.uk); Richard Williams; Gordon Black, Glan Clwyd Hospital, Rhyl

Patient consent obtained.

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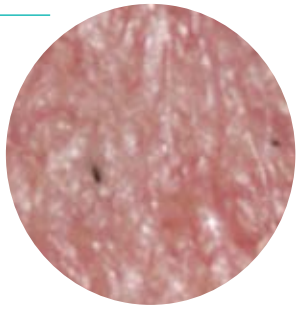
Rosacea



The Nurses' Health Studies have been running for decades and the vast amount of data that have been collected give rise to a stream of reports of associations between diet and health outcomes. The latest is a negative relation between coffee consumption and rosacea (*JAMA Dermatol*). Women who never drank coffee were 30% more likely to develop rosacea than those who drank four or more cups a day. Minerva was surprised that caffeine intake from sources other than coffee—such as chocolate and tea—seemed to have no protective effect.

Mild hypertension

A study in UK primary care using electronic records of nearly 40 000 people under 75 with mild hypertension but without symptoms or history of cardiovascular disease raises questions about the value of treatment. Over six years of observation, mortality was no lower in those receiving treatment than in those not prescribed antihypertensive medication (*JAMA Intern Med*). Adverse effects on the other hand, which included hypotension, syncope, electrolyte abnormalities, and acute kidney injury were statistically significantly commoner in those on treatment. Guidelines that recommend treatment for anyone with a blood pressure above 140/90 mm Hg may not be in the best interests of people at low risk of cardiovascular disease.

Cardiorespiratory fitness

Being physically fit is a good thing. Any number of studies have shown that it carries benefits for both cardiovascular and non-cardiovascular systems. But can one take it too far? Is there a point where vigorous exercise leads not to better health but to myocardial fibrosis, aortic dilation, and coronary artery calcification? Probably not, according to a follow-up study of more than 100 000 people who had exercise testing on a treadmill (*JAMA Netw Open*). The highest aerobic fitness was associated with the longest survival, regardless of age, sex, or comorbidities.

Embroidery and shell shock

After the first world war, some of the shell shocked survivors were encouraged to take up needlework as part of their rehabilitation. An article in the *Journal of the Royal Army Medical Corps* illustrates some of the remarkable embroidered artefacts that they produced, including altar frontals for several cathedrals (*J Royal Army Med Corps*). Although there's only anecdotal evidence that this form of therapy was helpful, the author wonders if similar creative activities could be used to help people with post-traumatic stress disorder today.

Errors in intravenous infusions

An observational study of the administration of more than 1000 intravenous infusions in NHS hospitals in England comes up with a paradoxical finding. Errors were common, affecting around 1 in 10 infusions, but very few were judged likely to result in harm to patients (*BMJ Qual Saf*). A lot of the errors occurred in labelling or in minor deviations from the prescribed rate of delivery. What's more, not all the deviations from what had been prescribed or stipulated by hospital policy were bad. Many arose because nurses were actively managing safety and patient care.

Cite this as: *BMJ* 2018;363:k4821

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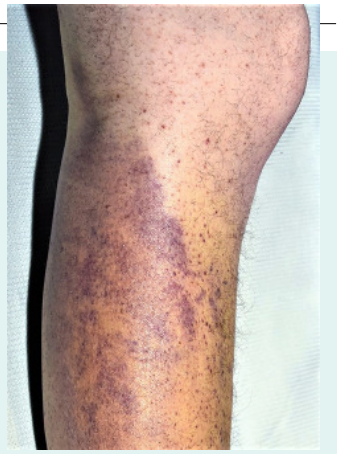

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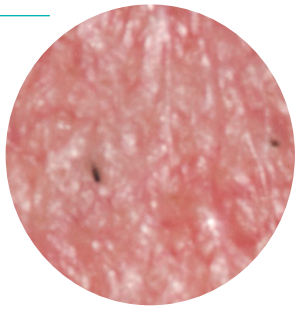

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