

## PRACTICE POINTER

# Identifying and managing deprivation of liberty in adults in England and Wales

William J Cutter,<sup>1</sup> Karla Greenberg,<sup>2</sup> Timothy R J Nicholson,<sup>3</sup> Ruth Cairns<sup>4</sup>

<sup>1</sup>Directorate of Older People's Mental Health, Hampshire Partnership NHS Foundation Trust, Gosport PO13 0GY, UK

<sup>2</sup>Department of Older Persons' Mental Health, Solent Healthcare, Langstone Centre, St James Hospital, Portsmouth, UK

<sup>3</sup>Section of Cognitive Neuropsychiatry, Department of Psychological Medicine, Institute of Psychiatry, King's College London, London, UK

<sup>4</sup>Department of Psychological Medicine, Institute of Psychiatry, King's College London

Correspondence to: W J Cutter [wjutter@gmail.com](mailto:wjutter@gmail.com)

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Clinicians are required by law to be able to identify and manage deprivation of liberty—this article explains how to do so

### Why read this article?

In England and Wales, depriving an adult of their liberty without a legal framework in place is unlawful. In recent years, the law governing restriction and deprivation of liberty has undergone several important changes, which have resulted in more safeguards for adults lacking mental capacity when it comes to deciding on their place of accommodation. This new legislation has also considerably increased the complexity of the legal framework that clinicians have to engage with. Healthcare professionals have a legal duty to be aware of this legislation; claiming ignorance is not defensible. However, they will be protected from legal liability provided the guidance in the relevant code of practice is adhered to and decisions, including the reasons for them, are thoroughly documented.

The Mental Capacity Act 2005<sup>1</sup> came into force in October 2007. In April 2009 the Mental Capacity Act was amended by the deprivation of liberty safeguards<sup>2</sup> in response to the issues raised by the Bournemouth judgment (box 1).<sup>3 4</sup> The amendment went through Parliament with the Mental Health Act 2007,<sup>5</sup> which was itself revised at the same time. In some emergency situations not covered by the aforementioned laws, when patients have capacity to make decisions about accommodation,

the common law may still apply. The application of these laws is complex and we discuss these complexities for the benefit of healthcare professionals.

All doctors—particularly those who treat patients in hospital with dementia, learning difficulties, and brain injury, as well as GPs, physicians, and psychiatrists who treat residents of care homes—need to be able to identify patients who are at risk of deprivation of liberty and ensure that the correct legal framework is applied. Most do not, however, need to have a detailed knowledge of procedures beyond that point. We therefore suggest a practical approach to the identification and initial man-

### Box 1 | The Bournemouth case and the European convention on human rights<sup>2 3</sup>

The Bournemouth case involved a young man (HL) with autism and learning difficulties who was admitted informally (not under the Mental Health Act) in 1997 to a mental health unit following an episode of self harm. Requests from his carers for him to be discharged were refused and they were not allowed to visit him. The case went up to the European Court of Human Rights, where the judgment found that the admission constituted a deprivation of HL's liberty that had not been in accordance with "a procedure prescribed by law." Specifically this was in breach of article 5(1) of the European Convention on Human Rights, and also article 5(4), because HL had "no means of applying quickly to a court to see if the deprivation of liberty was lawful." The European Court also said that "the key factor in the present case [is] that the healthcare professionals treating and managing the applicant exercised complete and effective control over his care and movements". They found "the concrete situation was that the applicant was under continuous supervision and control and was not free to leave."

### Article 5 of the European convention on human rights (edited extract)

#### Right to liberty and security

1. Everyone has the right to liberty and security of person.  
No one shall be deprived of his liberty save in the following cases and in accordance with a procedure prescribed by law: . . .  
(e) the lawful detention of persons for the prevention of the spreading of infectious diseases, of persons of unsound mind, alcoholics or drug addicts or vagrants; . . .
4. Everyone who is deprived of his liberty by arrest or detention shall be entitled to take proceedings by which the lawfulness of his detention shall be decided speedily by a court and his release ordered if the detention is not lawful.

### SUMMARY POINTS

Two pieces of legislation in England and Wales deal with deprivation of liberty in the hospital and care home: the deprivation of liberty safeguards and the Mental Health Act

The deprivation of liberty safeguards allow deprivation of liberty of people in hospitals or care homes who lack capacity to consent to physical or mental healthcare

The Mental Health Act (under some of its sections) allows the deprivation of liberty of people in hospital for the purposes of assessment or treatment of a mental (not physical) disorder

Where the purpose of detention in hospital is for the assessment or treatment of mental disorder and the patient objects to admission or treatment, use of the Mental Health Act should be considered before deprivation of liberty safeguards

The Mental Capacity Act allows restriction, but not deprivation of liberty

Decisions should be carefully considered and documented. Always consider whether care could be provided in a less restrictive way that could avoid the need for application of a legal framework

**Box 2 | Indicators that deprivation of liberty may be occurring<sup>2</sup>**

Professionals exercising complete and effective control over care and movement for a substantial period  
 Professionals exercising control over assessments, treatment, contacts, and residence  
 Decision taken by institution that a person will not be released into care of others or live elsewhere unless staff consider it appropriate  
 Use of restraint, including sedation, to admit a person who is resisting  
 The person would be stopped from leaving if they made a meaningful attempt to do so  
 Refusal of requests by carers for the person to be discharged to their care  
 Inability to maintain social contacts because of restrictions placed on access to others  
 Loss of autonomy owing to being under continuous supervision and control

**Box 3 | Stages to go through to decide whether someone is being deprived of their liberty<sup>2</sup>**

The decision-maker should consider:

- All the circumstances of each and every case
- What measures are being taken in relation to the individual? When are they required? For what period do they endure? What are the effects of any restraints or restrictions on the individual? Why are they necessary? What aim do they seek to meet?
- What are the views of the relevant person, their family or carers? Do any of them object to the measures?
- How are any restraints or restrictions implemented? Do any of the constraints on the individual's personal freedom go beyond restraint or restriction to the extent that they constitute a deprivation of liberty?
- Are there any less restrictive options for delivering care or treatment that avoid deprivation of liberty altogether?
- Does the cumulative effect of all the restrictions imposed on the person amount to a deprivation of liberty, even if individually they would not?

agement of deprivation of liberty, and we direct readers to more detailed information and advice elsewhere. Readers need to understand the principles of the assessment of mental capacity and best interests, as set out in the Mental Capacity Act Code of Practice<sup>6</sup> and as discussed in our previous review on assessing mental capacity.<sup>7</sup>

**Methods**

The primary sources for this article were the codes of practice for the Mental Capacity Act 2005,<sup>6</sup> the deprivation of liberty safeguards<sup>2</sup> and the Mental Health Act 2007.<sup>8</sup> Further information was gleaned from a recent legal judgment on the Office of the Public Guardian website.<sup>9</sup>

**What are “restriction” and “deprivation” of liberty?**

Neither term is given an exact definition by the codes of practice,<sup>2 6 8</sup> nor can they be; the definition will be different for every individual. Each person's situation needs to be carefully considered using the guidelines set out in the codes of practice<sup>2 6</sup> to conclude whether or not they are being deprived of their liberty. The deprivation of liberty safeguards code of practice<sup>2</sup> gives examples of situations that may indicate that the threshold for deprivation of liberty has been crossed (box 2), however restriction of liberty is not so clearly defined; it involves a degree of restriction of an individual's movements and freedom that falls below this threshold. For practical purposes, the distinction between restriction and deprivation in the context of the individual is crucial, because deprivation of liberty in the absence of “a procedure prescribed by law” is in breach of article 5 of the European Convention on Human Rights, whereas restriction of liberty is not. In other words, depriving

someone of their liberty is illegal unless you have in place a legal framework authorising it.

Restriction and deprivation of liberty are “a matter of degree or intensity, not nature or substance.”<sup>2</sup> There are no convenient measures that tell us when someone is being deprived of their liberty, such as the number of days for which they have been asking to leave a hospital or the number of times they have been restrained. Rather, it is the combined effect of all aspects of the care proposed or already being given for that particular individual that tell us if restriction or deprivation of liberty is occurring.

The deprivation of liberty safeguards code of practice<sup>2</sup> suggests that the factors that provide the degree or intensity that result in deprivation of liberty can relate to:

- The type of care being provided
- How long the situation lasts
- Its effects, or
- The way in which a particular situation came about.

**Guidance on the impact of specific interventions on a person's liberty status**

Although no precise definitions are available, we can take further guidance from the codes of practice where people lacking capacity are concerned.<sup>2 6</sup>

*Restraint*

Restraint is defined as occurring when a person uses force—or threatens to use force—to make someone do something that they are resisting, or to restrict a person's freedom of movement, whether they are resisting or not.<sup>6</sup> Restraint is permitted under the Mental Capacity Act provided it does not cause a deprivation of liberty. This situation may seem counterintuitive at first glance; however, the Mental Capacity Act tells us that restraint in many cases will only restrict someone's liberty. A more detailed discussion of this issue can be found in the online version of this article.

*Medical and nursing care*

Medical and nursing care can be given to individuals without necessarily depriving them of their liberty.<sup>6</sup>

*Emergency treatment*

Short-lived actions immediately necessary to prevent harm and/or provide emergency treatment may not, in themselves, constitute a deprivation of liberty.<sup>2 10</sup>

*Change of residence*

A change of residence, even if someone is objecting, does not necessarily constitute a deprivation of liberty.<sup>6</sup>

*Transport*

Transporting someone to a hospital or care home will not usually amount to a deprivation of liberty,<sup>2</sup> even where restraint is required or where there is an expectation that the person will be deprived of their liberty at the destination care home or hospital.

*Short lived illness*

Holding a patient in hospital to treat short lived physical illnesses that are causing a disturbance in mental state

## Differences between Mental Capacity Act, deprivation of liberty safeguards, and Mental Health Act

	Mental Capacity Act	Deprivation of liberty safeguards	Mental Health Act
What is the mental capacity status needed for a person to qualify for consideration under the legislation?	The person must lack capacity	The person must lack capacity	The person can either have or lack capacity
Is deprivation of liberty authorised?	No	Yes	Yes (certain sections)
What is the basic threshold set for someone to qualify for consideration under the legislation?	To lack capacity, a person must have an impairment of mind or brain that means that they are unable to do one or more of: (1) understand and (2) retain the information relevant to the decision, (3) use or weigh the information to reach a decision and (4) communicate their decision	The person must have a mental disorder as defined by the Mental Health Act (any disorder or disability of the mind)	The person must have a mental disorder (any disorder or disability of the mind)
Whom does the legislation protect?	Just the person lacking capacity	Just the person lacking capacity	The patient themselves and/or others
Are there restrictions on which patients with learning disability qualify for consideration under the legislation?	No—covers all people with learning disability (provided they lack capacity)	No—covers all people with learning disability (provided they lack capacity)	Yes—some sections (eg, 3, 37) only cover people with learning disability when they display abnormally aggressive or seriously irresponsible behaviour
When is restraint permitted under the legislation?	Allows restraint that is necessary to prevent harm to the person lacking capacity, and proportionate to that harm, but not if it deprives the person of their liberty	Allows restraint that is necessary to prevent harm to the person lacking capacity, and proportionate to that harm. The conditions of the individual deprivation of liberty authorisation must be followed	Allows restraint under certain sections
Does the legislation permit treatment?	Allows mental and physical health treatment in those lacking capacity, provided it is in their best interests.	Do not themselves authorise treatment. Where a person lacks capacity for a particular treatment, use the provisions of the Mental Capacity Act to provide it. Where they have capacity for a particular treatment use the common law and respect their decision.	Some sections (eg, sections 2 and 3) authorise mental health treatment. Physical health treatment is not authorised, except (rarely) when a physical condition is a consequence of or is causing a mental disorder

that is likely to resolve in a few days with treatment (for example, delirium) is unlikely to constitute a deprivation of liberty.<sup>2</sup> However, delirium that is not responding to treatment, or where the patient is being repeatedly restrained or prevented from leaving, represents a situation where the threshold for deprivation of liberty may be crossed and where the use of an appropriate legal framework should be considered.

It is important to realise that most factors could either give rise to no restriction, restriction, or deprivation of liberty; these states are on a continuum.

#### Which laws are relevant to deprivation of liberty?

The differences between laws that relate to deprivation of liberty are outlined and interpreted in the table.

#### The Mental Health Act 2007

The Mental Health Act<sup>5</sup> permits deprivation of liberty in hospital for people with mental disorder (regardless of whether they have mental capacity or not) under some of its sections.

#### The Mental Capacity Act 2005

The broader Mental Capacity Act<sup>1</sup> deals only with people aged 16 or over who lack capacity. It permits restriction, but not deprivation, of liberty except for people placed under the deprivation of liberty safeguards (see below) or people subject to a Court of Protection order that allows the person's deprivation of liberty.

The deprivation of liberty safeguards<sup>5</sup> are used to authorise deprivation of liberty for those aged 18 or over who lack capacity to make decisions about care or treatment in hospital or a care home, when circumstances amounting to deprivation of liberty are required to provide this care. They do not apply to other settings, such as a person's home. The proposed deprivation of liberty must be in the person's best interests. For a more detailed account of the provisions, see the Code of Practice<sup>2</sup> and Zigmond, 2009.<sup>4</sup>

Two types of deprivation of liberty authorisation exist<sup>2</sup>: urgent (lasting seven days) and standard (lasting up to a year). For the latter, the "managing authority" (the hospital trust or care home) must apply to a "supervisory body," which is the primary care trust for hospital patients in England and the Welsh ministers or the local health board in Wales. For patients in care homes in both countries the supervisory body is the local authority.

Urgent authorisations are usually required in unforeseen circumstances where the need for deprivation of liberty is so urgent that it must start before the standard authorisation can be completed, for example where someone in hospital is already being deprived of their liberty. The managing authority itself grants an urgent authorisation.

#### ADDITIONAL EDUCATIONAL RESOURCES

##### General resources

Deprivation of liberty safeguards code of practice ([www.dh.gov.uk/en/Publicationsandstatistics/Publications/PublicationsPolicyAndGuidance/DH\\_085476](http://www.dh.gov.uk/en/Publicationsandstatistics/Publications/PublicationsPolicyAndGuidance/DH_085476))  
 Mental Capacity Act code of practice ([www.publicguardian.gov.uk/mca/code-of-practice.htm](http://www.publicguardian.gov.uk/mca/code-of-practice.htm))  
 Office of the Public Guardian website ([www.publicguardian.gov.uk/index.htm](http://www.publicguardian.gov.uk/index.htm))—large resource containing a lot of information and forms concerning all aspects of the Mental Capacity Act  
 Mental Health Act 1983: revised code of practice ([www.dh.gov.uk/en/Healthcare/Mentalhealth/DH\\_4132161](http://www.dh.gov.uk/en/Healthcare/Mentalhealth/DH_4132161))

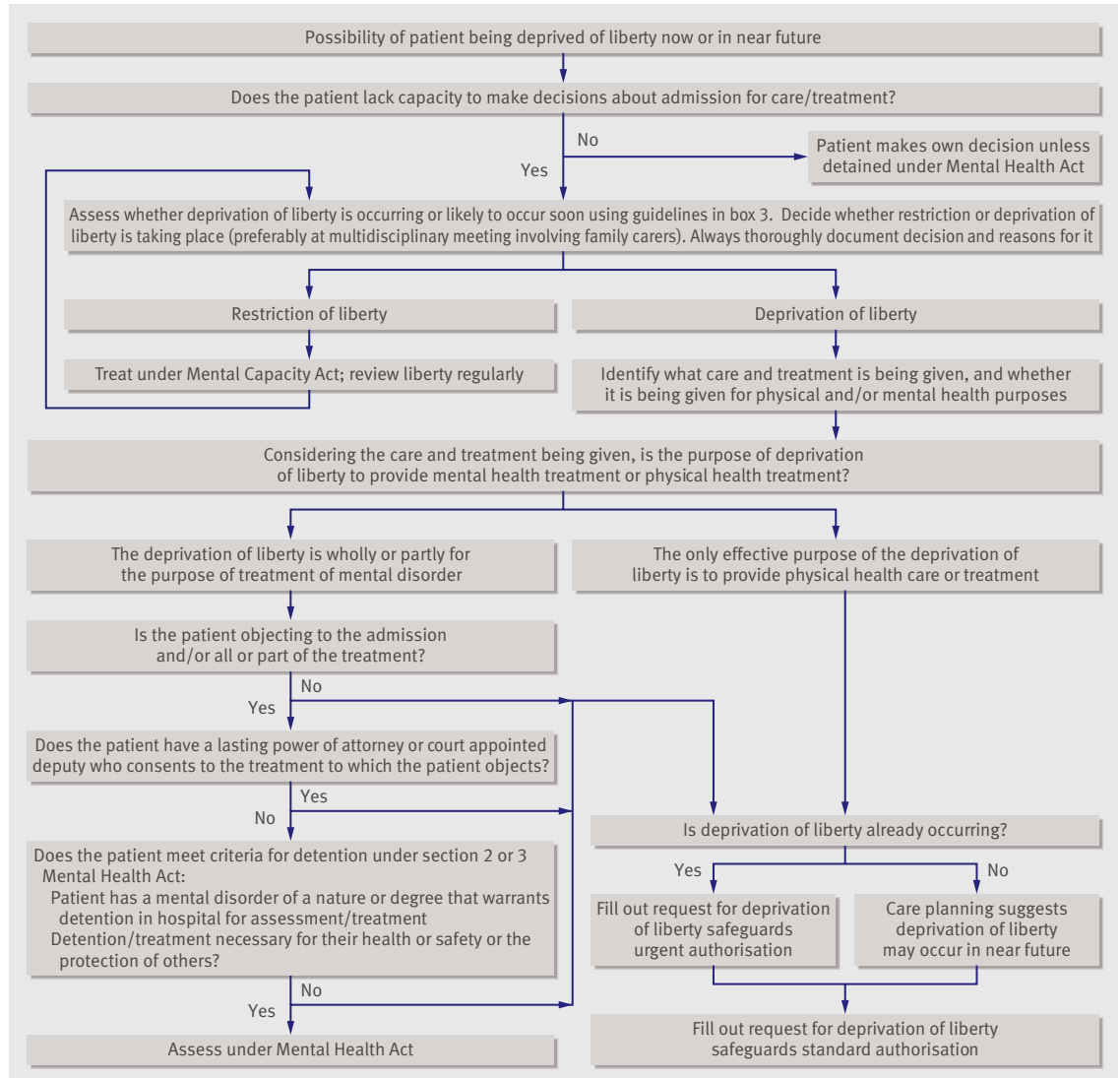
##### In your trust or area

Local policies and guidelines  
 Senior colleagues and local leads for mental health and mental capacity issues  
 On call or local community or liaison psychiatrists  
 Duty approved mental health practitioner (formerly known as approved social worker)  
 Local Mental Health Act office  
 Hospital legal team  
 Local social services and/or primary care trust (they are likely to have an office set up to administer deprivation of liberty safeguards)  
 Your personal medical defence organisation

**bmj.com/archive**

Previous articles in this series

- Assessing fitness for work and writing a “fit note” (*BMJ* 2010;341:c6305)
- Managing Parkinson’s disease during surgery (*BMJ* 2010;341:c5718)
- Communicating in a healthcare setting with people who have hearing loss (*BMJ* 2010;341:c4672)



**What to do when you suspect that someone in hospital is being deprived of their liberty**

tion and must only do so if they reasonably believe that the patient will meet criteria for a standard authorisation (which must be applied for at the same time).

**The common law**

In some emergency situations, the common law may still be applicable to the detention of people who have capacity, for example those being detained in the emergency department while a Mental Health Act assessment is convened. It may also apply to someone who lacks capacity, but requires emergency restraint or removal to prevent them harming others.<sup>6</sup>

**How to identify deprivation of liberty**

It is important to be vigilant for deprivation of liberty when assessing and treating patients, especially since the problem is not always obvious (box 2). Where this possibility is raised, we suggest a careful judgment must be made for each case following the guidelines contained within the deprivation of liberty safeguards shown in box 3 and using the indicators outlined in box 2. We maintain that it is good practice to arrive at this

judgment at a multidisciplinary meeting that includes family and other people involved in the patient’s care, and it is vital to carefully document that the possibility of deprivation of liberty has been considered, including a summary of the arguments for and against, which factors apply to your patient, and why you have reached the conclusion that you have. Once deprivation of liberty is identified, action must be taken to apply the appropriate legal framework.

**How to decide which legal framework applies to your situation**

**a) In hospital**

The flowchart and table provide guidance on deciding which legal framework is appropriate for a patient who is being deprived of their liberty in hospital. A detailed discussion to accompany the flowchart is included in the online version of this article at [bmj.com](http://bmj.com).

Before legal means are used to deprive someone lacking capacity of their liberty, consideration should be given to whether care and treatment could be achieved in a less restrictive manner.<sup>6</sup> For example, might a patient with



**Vignette 1**

An 81 year old man with no history of cognitive impairment is admitted with pneumonia. On the first night he is confused and agitated, saying that he is in a police station and demanding to leave. He requires restraint and sedation for his own safety. This also occurs the next night.

What power should be used here: Mental Capacity Act, Mental Health Act, or deprivation of liberty authorisation?

Answer—In view of the guidance in the deprivation of liberty safeguards code of practice,<sup>2</sup> this is restriction of liberty and not a situation where a deprivation of liberty authorisation should be considered. The delirium is expected to resolve as the pneumonia improves, therefore there is no expectation that the criteria for a standard authorisation would be met. The broader Mental Capacity Act does cover situations such as these and also requires that the least restrictive option is followed. It would therefore be quite proper to manage the situation under the Mental Capacity Act, but to regularly review the person's liberty.

After a further two days, the situation has worsened; the man requires a nurse to remain with him all the time to prevent him leaving and being physically aggressive to other patients. He is requiring restraint more frequently and for longer periods and is being given regular intramuscular sedative medication in an attempt to reduce his agitation.

Is he now being deprived of his liberty, and if so, which legal framework would authorise the detention?

Answer—The cumulative effect of all the restrictions placed upon him mean that the threshold has been crossed into deprivation of liberty because: the situation has not begun to resolve after a few days; he needs a nurse with him to stop him leaving; and prolonged and repeated restraint, together with intramuscular sedation is required. In this situation assessment under the Mental Health Act should be considered rather than deprivation of liberty safeguards because: he has a mental disorder (delirium); he is being detained in part for treatment of that mental disorder; he is objecting to remaining in hospital; he meets criteria for detention under the Mental Health Act, and; he is being deprived of his liberty in part to protect other people, and the deprivation of liberty safeguards do not provide a legal framework for depriving liberty in order to protect others.

He is detained under section 2 of the Mental Health Act. After two weeks he has settled to the point that the liaison psychiatrist discharges him from the section 2. As his pneumonia resolves, it becomes clear that he is left with severe cognitive impairment, and further investigation reveals a cerebrovascular accident. Occupational therapy assessment makes it clear that he is unsafe to return home, even with a full package of care. He is adamant that he won't go into a residential home and repeatedly says he will go home when discharged as he can look after himself.

How might placement in a residential home be legally achieved?

Answer—Where it is thought likely (as in this case) that placement in the residential home will result in deprivation of liberty, the residential home will need to request a deprivation of liberty standard authorisation before the placement starts.

**Vignette 2**

Mrs Z, A 72 year old woman with moderate Alzheimer's disease is a resident in a care home. She lacks capacity to decide on her place of residence. Her general practitioner visits her for a routine health check. While she is being examined, she tells the GP that she wants to go home, and asks him if he can help her escape. She then becomes tearful and pleads with him to take her home.

What should the GP do in this situation?

Answer—The GP should approach the care home manager to check whether the lady is under a deprivation of liberty authorisation. If she is not, then he should inform the manager that he is concerned this woman is being deprived of her liberty and that the home needs to review the situation. If they conclude that she is being deprived of her liberty, they either need to review and adjust her care plans in order to remove the deprivation of liberty, or they need to apply immediately for a deprivation of liberty authorisation.

The GP returns a week later to see another patient. The manager is not on duty, so he asks the deputy manager what the outcome of the situation with Mrs Z has been. The deputy manager says that no review of her care plans has taken place and no deprivation of liberty authorisation application has been made. The GP overhears Mrs Z asking a relative of another resident to take her home.

What should the GP do now?

Answer: He should approach the supervisory authority to inform them of his concerns that the patient is being illegally deprived of her liberty.

**Vignette 3**

A GP goes to see a 40 year old man with learning difficulties who has abdominal pain. He makes a diagnosis of acute appendicitis and arranges admission to the general hospital for an appendectomy. When the ambulance arrives to take the patient into hospital for his operation, he adamantly refuses. The GP decides he lacks capacity to refuse hospital admission, as he cannot retain information regarding the operation and the risks of not having it for long enough to make the decision, and only will say "I don't want to go to hospital." Following discussion with the surgeons and the patient's family, all agree that the operation is urgent and is in the best interests of the patient.

Is a deprivation of liberty authorisation required to legally transport him to hospital?

Answer—Transporting someone to hospital against their will does not usually constitute a deprivation of liberty. In this situation, the need for him to go to hospital is urgent and the GP and ambulance staff would be protected under the Mental Capacity Act if they need to restrain him and move him to hospital. Often, however, this kind of situation can be resolved without recourse to restraint—for example, if the patient's particular fear can be understood, or if a close family member or carer can go with them to hospital.

Unfortunately, by the time he arrives in hospital his condition has deteriorated and he has developed peritonitis. He undergoes laparotomy and has a complicated and prolonged post-operative course. He is likely to have to remain in hospital for at least several more weeks. Despite the best efforts of his family he repeatedly says he wants to go home, although he is too weak to get out of bed and walk. He often tries to resist the care he is given.

Does he need to be detained under the Mental Health Act to receive care and treatment?

Answer: The Mental Health Act is not applicable, since the patient is being deprived of his liberty entirely for the purposes of physical health care and treatment. In view of the length of the admission, his stated desire to go home, and his resistance to care, it is very likely that he has become deprived of his liberty. Applications should therefore be made by the managing authority (the hospital) for both urgent (as he is already being deprived of his liberty) and standard deprivation of liberty authorisations.

dementia who becomes agitated in the evenings be more settled if family members sat with them during that period? In circumstances where patients are being restricted in their liberty only, the principles of the Mental Capacity Act apply.<sup>1</sup> We suggest that patients should be reviewed regularly to assess whether the circumstances have changed.

Where a patient who lacks capacity is being, or is about to be deprived of their liberty, it must be determined whether the deprivation of liberty safeguards or the Mental Health Act is the more appropriate legal framework. This area is complex; consultation with an approved mental health professional or psychiatrist may be needed in uncertain cases, and an approved mental health professional is always required when the Mental Health Act is to be used. Recent case law has confirmed the primacy of the Mental Health Act over the deprivation of liberty safeguards<sup>9 11</sup> and reinforced that the purpose of the detention (whether for mental or physical health treatment) is the key to distinguishing which legal framework to use. This judgment concluded that use of the Mental Health Act must be considered first and ruled out only if the person does not meet the criteria for detention.

Only then can use of the deprivation of liberty safeguards be contemplated. In other words, if the Mental Health Act can be used, it should be used.

Another indicator that the Mental Health Act is the appropriate legal framework is when deprivation of liberty is required for the protection of other people; the Mental Capacity Act and deprivation of liberty of safeguards only provide protection for the individual lacking capacity themselves.

#### b) In a care home

In the care home setting, the Mental Health Act does not provide a route to legally deprive someone of their liberty. The only options therefore are to apply for a deprivation of liberty authorisation or, if the person requires transfer to hospital for treatment of a mental disorder, to arrange a Mental Health Act assessment.

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request from the corresponding author) and declare that all authors had: no financial support for the submitted work; no relationships with commercial entities that might have an interest in the submitted work; and no non-financial interests that may be relevant to the submitted work.

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## LESSON OF THE WEEK

# Hypothyroidism in a patient with non-alcoholic fatty liver disease

CJ Gardner,<sup>1</sup> P Richardson,<sup>2</sup> C Wong,<sup>1</sup> N Polavarapu,<sup>3</sup> GJ Kemp,<sup>4</sup> DJ Cuthbertson<sup>1</sup>

<sup>1</sup>Diabetes and Endocrinology Clinical Research Unit, University Hospital Aintree, Liverpool L9 7AL, UK

<sup>2</sup>Department of Hepatology, Royal Liverpool University Hospital, Liverpool L7 8XP

<sup>3</sup>Department of Gastroenterology, University Hospital Aintree, Liverpool L9 7AL

<sup>4</sup>Magnetic Resonance and Image Analysis Research Centre, University of Liverpool, Liverpool, L69 3GE

**Correspondence to:** D Cuthbertson [daniel.cuthbertson@liverpool.ac.uk](mailto:daniel.cuthbertson@liverpool.ac.uk)

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## Consider hypothyroidism as a cause of non-alcoholic fatty liver disease

Non-alcoholic fatty liver disease is increasingly recognised as a cause of chronic liver disease (affecting in some series 30-40% of the population<sup>1</sup>) and the commonest cause of abnormal liver function tests. The disease spans a spectrum of histopathological abnormalities, ranging from simple hepatic steatosis and steatosis with necroinflammation to steatosis with necroinflammation accompanied by varying degrees of fibrosis (which may progress to cirrhosis and its complications, including liver failure and hepatocellular carcinoma).<sup>2</sup>

Non-alcoholic fatty liver disease is characterised by a bright liver echo pattern on abdominal ultrasonography, and although it is often accompanied by raised liver enzymes, in many cases liver biochemistry is normal.<sup>3</sup> Most patients are asymptomatic, with liver disease identified incidentally from abnormalities discovered in routine biochemistry tests or imaging performed for other reasons.

Although obesity is the commonest and primary metabolic cause, non-alcoholic fatty liver disease may arise secondary to several other endocrine disorders, including thyroid dysfunction, growth hormone deficiency, adrenal insufficiency, and polycystic ovary syndrome.<sup>4</sup> It is important to consider and screen for underlying conditions in the

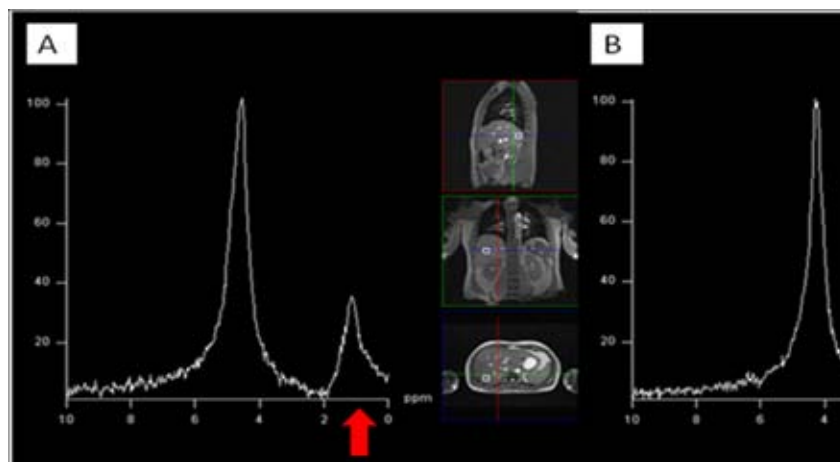
diagnostic approach to non-alcoholic fatty liver disease.

We report the case of a young man diagnosed with non-alcoholic fatty liver disease in whom an underlying cause was discovered.

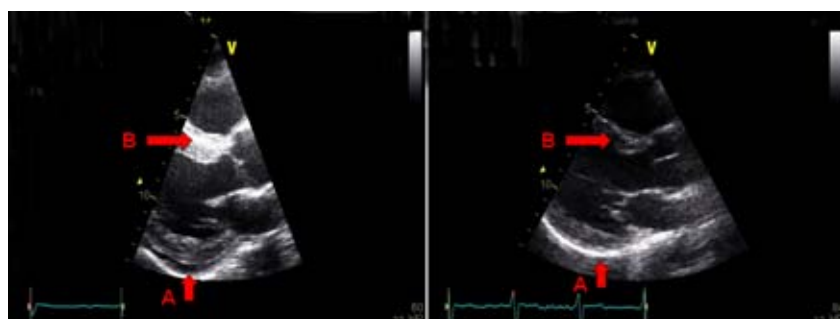
### Case report

A 33 year old, previously healthy man presented to his general practitioner with a hot swollen ankle of recent onset. He had no other joint involvement and no systemic symptoms apart from general lethargy, which he attributed to his shift work. He did not drink alcohol and was not taking any prescribed medication or over the counter drugs. He had a history of untreated obstructive sleep apnoea. His general practitioner diagnosed gout and recommended treatment with non-steroidal anti-inflammatory drugs but arranged to check renal function and liver function. These initial investigations showed abnormal liver biochemistry (aspartate aminotransferase 91 (normal range 13-42) U/L, alanine aminotransferase 60 (11-55) U/L, and gamma-glutamyl transferase 31 (0-55) U/L). Renal function showed a raised creatinine concentration of 143 (0-135)  $\mu\text{mol/L}$  and an estimated glomerular filtration rate of 54 mL/min/1.73m<sup>2</sup>. Over the following three months his liver and renal function remained abnormal, and he was therefore referred to the gastroenterology clinic for further investigation and management.

Clinical examination at the hospital was unremarkable. Initial laboratory investigations confirmed his abnormal



**Fig 1** | Pretreatment (A) and post-treatment (B) measurements of liver fat showing a reduction in hepatic triglyceride content from 12.7% at baseline to 5.9% after treatment. By means of proton magnetic resonance spectroscopy, areas of resonances from protons of water (large peak) and of methylene groups in the fatty acid chains of hepatic triglyceride (smaller peak, red arrow) were quantified and converted to percentages by a validated computer algorithm (Java based software jMRUI v.3.0)<sup>5</sup>



**Fig 2** | Parasternal long axis views before (left) and after (right) thyroxine replacement. A 1.2 cm pericardial effusion (A) and moderate (1.7 cm) septal hypertrophy (B) were noted before treatment, both of which resolved on follow-up scanning

liver biochemistry. Liver specific auto-antibody screen was negative with normal immunoglobulin electrophoretic pattern. There were normal concentrations of  $\alpha_1$  antitrypsin, ferritin, transferrin saturations, copper, and ceruloplasmin. Markers for chronic viral hepatitis B and C were negative. He also had hyperlipidaemia (total cholesterol 9.2 mmol/L, triglyceride 7.1 mmol/L, and high density lipoprotein cholesterol 1.5 mmol/L; low density lipoprotein cholesterol could not be calculated). Liver ultrasonography showed a bright liver echo pattern consistent with steatosis but no evidence of established cirrhosis. Non-alcoholic fatty liver disease was diagnosed on the basis of the clinical information.

The patient subsequently consented to participate in a research study investigating the effects of supervised exercise in non-alcoholic fatty liver disease. At entry into the study the patient weighed 97 kg, with a body mass index of 31 (weight (kg)/(height (m)<sup>2</sup>). Non-invasive quantification of liver fat by proton magnetic resonance spectroscopy<sup>5</sup> confirmed the clinical diagnosis of non-alcoholic fatty liver disease with a hepatic fat content of 12.7% (normal range <5.6%, fig 1A). As part of his cardiovascular screening before exercising, echocardiography showed a small pericardial effusion (fig 2). Further biochemical investigations, undertaken to explain the pericardial effusion, uncovered profound hypothyroidism,

with a thyroid stimulating hormone concentration of 151 (0.4-4.5) mU/L and a free thyroxine concentration of 2.6 (8-21) pmol/L. Thyroid microsomal antibodies were markedly raised at 269 (<80) IU/mL. Further questioning in the endocrine clinic found no further symptoms apart from profound lethargy, and he had no family history of thyroid or other autoimmune disease. Examination showed coarse facial features and a mild bradycardia but no other clinical signs. Replacement therapy with thyroxine was started (50 µg daily, increased to 100 µg daily after one week), and after informed consent, investigations were repeated after six weeks. At this time the patient's weight had fallen to 90 kg and his thyroid stimulating hormone concentration had decreased to 2.82 mU/L, indicating biochemical euthyroidism. Liver function tests were normal (aspartate aminotransferase 37 U/L, alanine aminotransferase 45 U/L, and gamma-glutamyl transferase 27 U/L) and his lipid profile had dramatically improved (total cholesterol 4.4 mmol/L, triglyceride 1.8 mmol/L, high density lipoprotein cholesterol 0.8 mmol/L, low density lipoprotein cholesterol 2.8 mmol/L). The pericardial effusion resolved (fig 2), and liver fat had more than halved to 5.9%, indicating almost complete resolution of his non-alcoholic fatty liver disease (fig 1B).

### Discussion

This case illustrates a common scenario: coincidental presentation of non-alcoholic fatty liver disease with abnormal liver biochemistry performed for an unrelated reason, in this case presenting with an episode of acute gout. Most importantly, however, this case shows that primary hypothyroidism may mimic liver disease and in particular drive the development of non-alcoholic fatty liver disease and associated obesity and dyslipidaemia. Gout in this instance may have been precipitated by the patient's hypothyroid state.<sup>6</sup>

General practitioners and hospital specialists should be alert to the possibility of thyroid dysfunction in any patient with unexplained liver biochemistry or with a clinical suspicion of non-alcoholic fatty liver disease. In our patient, primary hypothyroidism was discovered only opportunistically, through his participation in a clinical research study and the discovery of the clinically silent small pericardial effusion. His clinical and biochemical abnormalities would otherwise have been attributed solely to non-alcoholic fatty liver disease. Treatment of the primary hypothyroidism resulted in normalisation of liver biochemistry and reduction in liver fat and probably reduced the risk of long term hepatic or cardiovascular sequelae of non-alcoholic fatty liver disease.

The diagnostic investigations for any patient with suspected non-alcoholic fatty liver disease include serology for hepatitis B and C, autoantibodies, iron studies, serum ceruloplasmin, fasting glucose and lipids, and liver ultrasonography.<sup>7</sup> The diagnosis of non-alcoholic fatty liver disease is often a diagnosis of exclusion, made when the tests mentioned above are normal and when the patient has other concomitant features of the metabolic syndrome such as central obesity, dyslipidaemia, hypertension, and glucose intolerance. The possibility of hypothyroidism as an underlying cause is rarely considered in the assessment of non-alcoholic fatty liver disease despite the common clinical and biochemical features of central obesity, abnormal liver transaminases,



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- ▶ Acute liver failure after administration of paracetamol at the maximum recommended daily dose in adults (*BMJ* 2010;341:c6764)
- ▶ Proton pump inhibitors and acute interstitial nephritis (*BMJ* 2010;341:c4412)
- ▶ Opioid induced hypogonadism (*BMJ* 2010;341:c4462)

and hypertriglyceridaemia observed in both non-alcoholic fatty liver disease and hypothyroidism.

The many clinical associations between hypothyroidism and liver diseases are unsurprising given the multiple effects of thyroid hormones on liver function, cholesterol regulation, and insulin sensitivity.<sup>8-9</sup> The prevalence of hypothyroidism in patients with non-alcoholic fatty liver disease is twice that in patients with other chronic liver diseases (15% v 7.2%),<sup>10</sup> and even in patients with non-alcoholic fatty liver disease whose thyroid function is normal, free thyroxine and triiodothyronine concentrations are significantly lower than in controls.<sup>7</sup> Rodent models of non-alcoholic fatty liver disease support a direct hepatic, therapeutic effect of thyroid hormones with regression of hepatic steatosis using either thyroid hormones or liver specific thyroid hormone receptor agonists.<sup>11-13</sup> Mild hypothyroidism may also cause increased gamma-glutamyl transferase and alanine aminotransferase and promotes gallstone disease.<sup>7</sup> The incidence of hypothyroidism is also higher in patients with hepatocellular carcinoma.<sup>14</sup>

Although obesity has independent effects on liver fat, hepatic steatosis in hypothyroidism is likely to be the result of additional factors. The link between non-alcoholic fatty liver disease and features of the metabolic syndrome (including insulin resistance) and type 2 diabetes mellitus is well described.<sup>15</sup> However, other endocrinopathies are increasingly implicated in the aetiology of non-alcoholic fatty liver disease. Patients with hypopituitarism have an increased incidence of non-alcoholic fatty liver disease, particularly patients with growth hormone deficiency,<sup>16-17</sup> and growth hormone levels are lower in men with non-alcoholic fatty liver disease than in normal controls.<sup>18</sup> Growth hormone replacement normalised steatosis with necroinflammation and hypercholesterolaemia in a single case report. Non-alcoholic fatty liver disease is said to be more prevalent in both polycystic ovarian syndrome and adrenal insufficiency.<sup>4</sup> Secondary endocrine causes of non-alcoholic fatty liver disease are increasingly recognised, and some specialists have suggested such causes should be systematically considered in all patients in whom non-alcoholic fatty liver disease is diagnosed.<sup>19</sup>

This case illustrates that primary hypothyroidism and other endocrinopathies are important conditions to consider as possible underlying causes in patients with non-alcoholic fatty liver disease or with abnormalities of liver biochemistry. The diagnosis of non-alcoholic fatty liver disease is not an end in itself but should provoke consideration of underlying conditions.

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## Studenpedia

Our final MB exam was only a few weeks away, and one of our senior lecturers was taking the last tutorial before the exam. We could feel the tension in the room, anxiety was written all over our faces.

The lecturer, experienced in this sort of situation, was trying to reduce the stress and make us relax. "After all," he said, "as an MBBS doctor, you will only be expected to know the common presentations of common diseases. When you specialise and become a consultant then you will be expected to know, in addition, the common presentations of rarer diseases and the rarer presentations of common diseases."

At that point a student put his hand up to ask a question: "Sir, who then will know the rarer presentations of rare diseases?"

"Students," replied the lecturer without batting an eye, "medical students."

John Godfrey general practitioner, Liverpool, UK [john@jigodfrey.com](mailto:john@jigodfrey.com)

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