Managing suspected meningococcal disease: a case-based clinical approach

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Abstract

Invasive meningococcal disease (IMD), caused by *Neisseria meningitidis*, is a life-threatening infection that requires rapid recognition and immediate antimicrobial treatment. This case examines the assessment, diagnosis and management of suspected IMD in a 23-year-old male, with a particular focus on evidence-based prescribing and the role of the non-medical prescriber (NMP). A structured assessment was undertaken using the Calgary–Cambridge model, integrating both subjective and objective data, including clinical findings, laboratory investigations and timely pharmacological intervention. The patient presented with fever, a purpuric rash, photophobia and headache, features consistent with suspected IMD. The patient was treated with intravenous ceftriaxone 2 g 12-hourly and oral ibuprofen 400 mg 8-hourly. Serogroup C IMD was subsequently confirmed in hospital, and the patient made a full recovery within 10 days without adverse effects. This case highlights the importance of early clinical recognition and the prompt administration of third-generation cephalosporins in improving outcomes. It reinforces the need for adherence to evidence-based guidelines and underscores the pivotal role of NMPs in delivering safe, timely, and effective care in acute, high-risk presentations.

Key words: | Meningococcal disease | Invasive meningococcal disease | Early recognition | Medicine management | Non-medical prescriber | Antibiotic therapy | Public health notification

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Invasive meningococcal disease (IMD) is a rapidly progressive bacterial infection, presenting as meningitis, septicaemia or both (Stephens et al, 2007; Rouphael and Stephens, 2012). Despite advances in antimicrobial therapy and critical care, IMD remains associated with significant mortality and long-term morbidity, including hearing loss, neurocognitive impairment, scarring, and limb loss (Bosis et al, 2015; Parikh et al, 2020; World Health Organization (WHO), 2025).

It continues to be a major public health concern, with 1 149 confirmed cases and 110 deaths reported in the EU/European Economic Area (EEA) in 2022 (European Centre for Disease Prevention and Control (ECDC), 2024).

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From a prescribing perspective, IMD is a medical emergency requiring rapid decision-making. Early symptoms are often non-specific and may resemble self-limiting viral illness; however, features such as fever, severe headache, photophobia and a non-blanching rash should prompt urgent assessment and immediate empirical antibiotic treatment (Nadel and Carcillo, 2016; National Institute for Health and Care Excellence (NICE), 2024; UK Health Security Agency (UKHSA), 2025). This case examines how evidence-based guidance informed assessment, prescribing and medicines management for a 23-year-old male presenting with suspected IMD.

The case is structured to provide clinical context through a focused overview of IMD, followed by the patient's presentation, diagnostic investigations, prescribing rationale and clinical outcome. The discussion critically appraises the management strategy in relation to current national guidelines and pharmacological evidence, with particular emphasis on antimicrobial choice, safety considerations, and the clinical governance responsibilities underpinning safe prescribing practice by non-medical prescribers (NMPs).

Table 1. Summary of patient presentation, investigation and treatment

Parameter	Details
Demographics	23-year-old male
Presenting complaint	Spreading rash, fever, headache
Rash distribution	Palms, soles, abdomen
Examination	Purpuric rash; photophobia elicited on examination; 39.6°C
Neurological features	Photophobia on examination; no nuchal rigidity; no altered level of consciousness
Pain score	7/10
Leukocyte count	Elevated
Platelet count	Low/borderline low
Tests	Skin biopsy, immunoglobulin M (IgM) serology
Treatment	Ceftriaxone 2 g intravenous IV every 12 hours
Diagnostic confirmation	Gram-negative diplococci on skin biopsy; IgM serology positive for *N. meningitidis* serogroup C
Final diagnosis	Invasive meningococcal disease, serogroup C
Outcome	Full recovery, discharged day 10

Background: invasive meningococcal disease

IMD is caused by *Neisseria meningitidis*, a Gram-negative diplococcus that colonises the nasopharynx asymptomatically before invading the bloodstream or meninges in susceptible individuals. Thirteen serogroups are recognised, with geographic variation in predominant strains (Parikh et al, 2020), and worldwide incidence is estimated at approximately 500 000 cases annually; a fatality rate of 6–10% is reported, and survivors may experience long-term morbidity, including hearing loss, cognitive impairment and limb amputation (Bosis et al, 2015). Recognised risk factors include communal living environments, lower socioeconomic status, and unvaccinated status. Given the global burden, the 73rd World Health Assembly promoted the Defeating Meningitis by 2030 roadmap (WHO, 2020), targeting a 50% reduction in preventable cases and a 70% reduction in deaths.

IMD most commonly manifests as meningitis, septicaemia or both. Early symptoms mimic viral illness – fever, headache, and sore throat – before rapidly progressing within hours to days (Nadel and Carcillo, 2016). Cardinal features when infection is established include fever, severe headache, photophobia, neck stiffness, and a non-blanching purpuric rash.

Vaccination remains the most effective prevention strategy; in the UK, all first-time university students are advised to receive the MenACWY vaccine. Post-exposure chemoprophylaxis is recommended for close contacts to eradicate nasopharyngeal carriage and reduce secondary transmission (NICE, 2026). Early antibiotic therapy remains the primary treatment strategy and should not be delayed while waiting for confirmatory diagnosis.

Case presentation

A 23-year-old male was transferred to the emergency department (ED) by paramedic crew following clinical assessment in the community. Recognising features consistent with suspected IMD and noting their close proximity to the ED, the attending crew made the clinical decision to transfer immediately rather than initiate pre-hospital treatment (*Table 1*).

While it is noted that ambulance formularies guided by Joint Royal Colleges Ambulance Liaison Committee (JRCALC) carry benzylpenicillin for suspected bacterial meningitis, ceftriaxone and dexamethasone, as recommended in NICE guideline NG240, are not currently included within the JRCALC paramedic scope of practice and are therefore unavailable to paramedic clinicians. From a prescribing perspective, paramedic independent prescribers (IP) are able to prescribe these agents within their prescribing formulary, enabling earlier access to time-critical treatment in IMD.

This case is presented not only as a clinical account of IMD management, but also as a contribution to the growing evidence-base

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supporting the development of JRCALC clinical guidelines within UK NHS ambulance services to include these time-critical medications.

The consultation was conducted using the Calgary–Cambridge model (Kurtz et al, 2003), which integrates objective clinical findings and the patient's subjective experience of illness. The patient reported that the rash had initially appeared on the palms of his hands, soles of his feet, and abdomen, with no associated fever. Over the following 3 days the rash developed a purplish discolouration, accompanied by a persistent throbbing headache and high-grade fever. He rated his pain as 7 out of 10 on the Numerical Rating Scale (NRS), a validated 11-point self-report tool (Hartrick et al, 2003). On direct questioning, the patient reported photophobia and denied nausea, vomiting, drowsiness, or reduced consciousness.

Past medical history was unremarkable, with no known drug allergies (NKDA) and no regular prescribed or over-the-counter medicines. The patient had not previously received meningococcal vaccination. Social history indicated that he lived with friends, worked in an office and regularly attended crowded social events. Young adults in communal settings are a recognised higher-risk group for meningococcal transmission (Parikh et al, 2020; Dogu et al, 2021; ECDC, 2024).

Physical examination revealed mild-to-moderate purpuric rashes across the palms and soles, extending over approximately half of the abdominal surface. Core temperature peaked at 39.6°C. Although photophobia had not been volunteered initially, it was elicited on clinical examination; nuchal rigidity was absent. Cardiovascular and respiratory examinations were otherwise unremarkable. The absence of nuchal rigidity is consistent with recognised variability in IMD presentation; the classical meningitis triad is present in only approximately 27% of cases (Sethi et al, 2012; Nadel and Carcillo, 2016).

Laboratory investigations revealed a leukocyte count of 13 000/µL and a count of 140 000/µL. In the context of fever and a purpuric rash, this borderline thrombocytopenia heightened clinical concern for meningococcal septicaemia. A skin biopsy identified Gram-negative diplococci consistent with *Neisseria meningitidis*; serological testing confirmed IgM antibodies against *N. meningitidis* serogroup C.

Diagnosis

The final diagnosis was IMD caused by *N. meningitidis* serogroup C, based on the clinical picture and confirmatory serological and histological testing. Cardinal diagnostic features were the rapid progression of illness, high fever, severe headache, photophobia and a non-blanching purpuric rash. IMD does not always present a complete meningitis picture; septicaemic features may dominate and delayed recognition is well described (Kerneïs et al, 2009; Nadel and Carcillo, 2016; Durkin et al, 2021).

Definitive diagnosis of IMD ideally involves lumbar puncture (LP) for cerebrospinal fluid (CSF) analysis. In this case, LP was not performed due to the clinical urgency of the presentation and the immediate requirement for empirical therapy, consistent with NICE (2024) guidance that treatment must not be delayed pending confirmatory investigation. The absence of CSF analysis and polymerase chain reaction (PCR) confirmation is acknowledged as a diagnostic limitation; where clinically safe to do so, lumbar puncture and PCR should be pursued to enable definitive serogroup characterisation and inform antimicrobial stewardship. For prescribers, the key principle is that treatment decisions must be made before full diagnostic certainty is available (NICE, 2024; UKHSA, 2025).

Drug choice and administration

The key prescribing decision was prompt initiation of intravenous (IV) ceftriaxone in line with NICE NG240 guidance (NICE, 2024), which recommends immediate parenteral antibiotic therapy for suspected IMD with ceftriaxone as first-line treatment. IV administration ensured rapid attainment of therapeutic concentrations. A dosing regimen of 2 g IV every 12 hours was initiated, with duration guided by ongoing clinical review (Molyneux et al, 2011). In cases of penicillin or cephalosporin allergy, alternatives such as chloramphenicol or meropenem would be considered (Blain et al, 2016).

Prior to prescribing, a comprehensive medication history and focused safety assessment were undertaken. The patient denied hypersensitivity to penicillins, cephalosporins, or non-steroidal anti-inflammatory drugs (NSAIDs), and had no history of gastrointestinal ulceration or bleeding, renal impairment, cardiac failure, or previous adverse drug reactions. This screening was essential, as allergy status and organ dysfunction can significantly influence antimicrobial selection and safety (Blain et al, 2016; BNF/NICE, 2026).

Adjunctive treatment with ibuprofen 400 mg orally (PO) every 8 hours was prescribed for headache (7/10 NRS). Although symptom control was not the primary therapeutic priority, appropriate analgesia improved patient comfort without conflicting with the overall treatment strategy. NSAIDs require cautious use in the context of possible sepsis, given their effects on renal perfusion and platelet function. In addition to the standard contraindication screen, the patient's

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haemodynamic stability on admission, absence of renal impairment on initial blood tests, and stable platelet count were considered. Ibuprofen was therefore judged appropriate for short-term symptomatic use with close monitoring of renal function and clinical status throughout the admission (McGill et al, 2016; BNF/NICE, 2026).

The safety profile of ceftriaxone was carefully reviewed. While generally well tolerated in adults, adverse effects including gastrointestinal disturbances have been reported; rare but serious reactions occur more frequently in paediatric populations (Zeng et al, 2020). The benefits of prompt administration were judged to outweigh potential risks with appropriate monitoring in place. No clinically hazardous interactions were identified between ceftriaxone and ibuprofen; evidence suggests a possible synergistic analgesic effect when co-administered (Stepanovic-Petrovic et al, 2014). Ceftriaxone must not be administered concomitantly with calcium-containing IV solutions through the same line, and careful line management was maintained throughout (Zeng et al, 2017).

NICE (2024) recommends IV dexamethasone concurrently, with the first antibiotic dose in suspected bacterial meningitis to reduce inflammatory-mediated neurological complications. Within JRCALC clinical guidelines, dexamethasone is currently limited to orally (PO) administration for the treatment of croup; this indication and route are not appropriate for IMD.

Dexamethasone does not feature in JRCALC clinical guidelines for the treatment of IMD for frontline paramedics and therefore is outside the scope of pre-hospital clinical practice for UK NHS ambulance services in this case. Dexamethasone was initiated promptly on the patient's arrival in the ED. Clear clinical handover documenting the time of antibiotic administration is essential to ensure dexamethasone is not inadvertently delayed at the point of hospital arrival.

Evidence-based guidelines

Prescribing was guided primarily by NICE (2024) NG240, which recommends immediate parenteral antibiotic therapy in suspected IMD, identifying ceftriaxone as first-line treatment and cefotaxime as an alternative where ceftriaxone is contraindicated (*Table 2*). These recommendations reflect strong consensus that early effective antimicrobial therapy is critical in reducing morbidity and mortality.

Hahné et al (2006), in a systematic review of 14 observational studies in England and Wales, demonstrated improved survival in patients who received early antibiotics, supporting the principle that early antimicrobial exposure improves outcomes. Sudarsanam et al (2013), reviewing 31 studies involving 510 participants, found no evidence for routine pre-admission oral antibiotics but supported the safety and effectiveness of parenteral ceftriaxone in reducing mortality – directly informing NICE's emphasis on prompt parenteral treatment. Trestioreanu et al (2013), in a review of 24 studies, demonstrated that ceftriaxone and ciprofloxacin are highly effective in eradicating *N. meningitidis* carriage with a lower resistance risk than rifampicin, underpinning public health chemoprophylaxis strategies (UKHSA, 2025).

Table 2. Evidence base supporting prescribing decisions

Evidence source	Key findings relevant to this case
Hahné et al (2006)	Early antibiotic administration reduces mortality in IMD; supports prompt treatment initiation
Sudarsanam et al (2013)	Parenteral ceftriaxone safe and effective; no evidence for pre-admission oral antibiotics
Trestioreanu et al (2013)	Ceftriaxone and ciprofloxacin highly effective for *N. meningitidis* eradication with low resistance risk
National Institute for Health and Care Excellence (2024)	Recommends immediate parenteral ceftriaxone as first-line therapy for suspected IMD
UK Health Security Agency (2025)	Statutory notification, contact tracing, and ciprofloxacin chemoprophylaxis for close contacts

Pharmacokinetics

Ceftriaxone has a plasma half-life of approximately 6–8 hours in adults with normal renal function, supporting 12-hourly dosing and enabling consistent therapeutic plasma concentrations (Yuk et al, 1989; Srivastava et al, 2020). Following IV administration, the volume of distribution ranges from 5.80–13.5 L in healthy adults and may increase to 6.50–35.2 L in septic patients, reflecting altered pharmacokinetics in severe infection. High protein binding (approximately 85–95%) is concentration-dependent, with a higher free fraction at elevated plasma concentrations enhancing tissue penetration. Elimination occurs via both renal and biliary pathways, providing resilience in mild-to-moderate renal impairment. In overdose, haemodialysis is ineffective; symptomatic management is recommended.

Pharmacodynamics

Ceftriaxone exerts bactericidal activity through inhibition of bacterial cell wall synthesis via binding to penicillin-binding proteins (PBPs), including carboxypeptidases, endopeptidases, and transpeptidases, disrupting mucopeptide cross-linking and causing bacterial cell death. It demonstrates broad-spectrum activity against Gram-negative and Gram-positive aerobic and anaerobic organisms, including *N. meningitidis*, and

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Table 3. Clinical progression during admission

Timeframe	Clinical status
Day 1–2	Persistent fever (39.6°C), headache 7/10 NRS, spreading purpuric rash; dexamethasone initiated on ED arrival
Day 3–5	Fever settling; headache improving (3/10 NRS); rash spread ceased; platelet count recovering
Day 7	Rash fading; systemically well; full blood count normalising
Day 10	Discharged with full clinical recovery; nasal and throat swabs taken; telephone follow-up arranged

Table 4. Medicines management considerations

Aspect	Consideration
Allergy status	No beta-lactam or NSAID allergy confirmed
Drug interactions	No clinically significant interaction between ceftriaxone and ibuprofen identified; possible synergistic analgesic effect
Adverse effects	Monitoring for gastrointestinal, haematological, and renal effects; NSAID caution in context of sepsis reviewed and justified
Administration	Ceftriaxone must not be co-administered with calcium-containing IV solutions through the same line
Monitoring	Vital signs, temperature, rash progression, full blood count, renal function reviewed throughout admission
Public health	UKHSA notification made; contact tracing initiated; ciprofloxacin 500 mg offered to close contacts (UKHSA, 2025)

is stable against hydrolysis by many β-lactamases. Despite potential resistance mechanisms including reduced cell wall permeability and PBP alterations, resistance among *N. meningitidis* strains remains uncommon, and ceftriaxone retains a reliable first-line role in IMD.

Pharmacoeconomics

In a life-threatening infection, cost must not delay treatment; however, pharmacoeconomic reasoning supports ceftriaxone selection. Although its acquisition cost exceeds that of some older agents with an NHS indicative price of £18.30–£19.18 per 2 g vial (NHS Business Services Authority, 2026), total episode-of-care costs are influenced by preparation time, line access, and length of stay. Davis and Bryson (1994) demonstrated that 12-hourly ceftriaxone can reduce total antimicrobial expenditure by 17–52% compared with regimens requiring three to six daily doses, when procurement, preparation, and administration costs are comprehensively considered. Ceftriaxone has also been shown to be more cost-effective than alternative antimicrobial regimens due to lower hospitalisation costs and shorter length of stay (Davis and Bryson, 1994).

Adjunctive ibuprofen did not contribute significantly to treatment costs, providing effective symptomatic relief without additional financial burden (NHS Business Services Authority, 2026).

Patient and clinical monitoring

The patient was admitted for close inpatient monitoring, with vital signs recorded regularly throughout the admission (*Table 3*). Oxygen therapy was administered to support respiratory function, and dexamethasone was initiated by the receiving medical team on hospital arrival. Progressive clinical improvement was observed from day 3: pain reduced to 3/10 NRS; rash spread ceased 5 days after commencing ceftriaxone; temperature normalised to 37°C within 4 days.

By day 7 the patient was systemically well, with platelet count returned to within normal limits on serial full blood counts. No significant adverse effects attributable to ceftriaxone or ibuprofen were recorded. The patient was discharged on day 10 with verbal and written advice regarding home recovery, nasal and throat swabs taken at discharge, and telephone surveillance arranged for a further week. The patient was advised to attend the ED promptly if new symptoms developed. This favourable outcome is consistent with evidence that prompt recognition and early parenteral antibiotic treatment improve prognosis in IMD (Hahné et al, 2006; Nadel and Carcillo, 2016; NICE, 2024).

Public health management

IMD is a statutorily notifiable disease under the Public Health (Control of Disease) Act 1984. Notification to the UK Health Security Agency was made promptly following the confirmed diagnosis. Contact tracing was initiated to identify close contacts within the 10 days prior to symptom onset, including household members and close social contacts.

In accordance with UKHSA and NICE (2026) guidance, close contacts were offered prophylactic ciprofloxacin 500 mg as a single oral dose, or rifampicin as an alternative, to eradicate asymptomatic nasopharyngeal carriage of *N. meningitidis* and reduce the risk of secondary transmission. The patient's unvaccinated status was addressed as part of discharge planning, with meningococcal vaccination offered alongside written information regarding the UK vaccination schedule.

Discussion

This case demonstrates how a young adult with initially non-specific symptoms can develop a clinical picture strongly suggestive of IMD over a short period. It is important for prescribers to consider IMD early when fever, severe headache, and a non-blanching or purpuric rash occur

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together, even when classical meningism is incomplete (Sethi et al, 2012; Nadel and Carcillo, 2016; Mularski and Zaba, 2019).

The patient's evolving symptoms, social context, unvaccinated status, photophobia, purpuric rash, and borderline thrombocytopenia all directly influenced prescribing. The decision to initiate IV ceftriaxone was justified because it aligned with current guidance, matched the likely pathogen, suited the severity of illness, and had an acceptable safety profile in an adult with no relevant contraindications (NICE, 2024; BNF/NICE, 2026). The medicines management considerations arising from this case are summarised in *Table 4*.

A further point of reflection concerns prevention. Vaccination status did not determine diagnosis, but the patient's lack of meningococcal vaccination is clinically significant because vaccination remains the primary preventive strategy against major serogroups, with protection varying by vaccine formulation and serogroup coverage (Parikh et al, 2020; WHO, 2025). Young adults in communal settings remain an important risk group for transmission and outbreaks (Marshall et al, 2019; Dogu et al, 2021).

The principal limitation of this report is that it describes a single case and therefore cannot compare the efficacy of competing treatment regimens. Nevertheless, the case remains valuable in demonstrating how current evidence and national guidance are applied to real-world prescribing decisions in acute, time-critical care.

Clinical governance

Clinical governance provides the framework within which clinicians are accountable for the quality and continuous improvement of patient care. All prescribing in this case was conducted in accordance with current evidence-based guidelines (NICE, 2024; 2026), using a systematic approach to diagnosis, drug therapy and monitoring. The prescribing clinician accepted responsibility for identifying and proactively managing medication-related risks. No adverse drug reactions occurred, and outcomes were assessed against measurable clinical parameters including temperature trend, rash progression, platelet count normalisation and patient-reported pain scores.

This case demonstrates the capacity of NMPs to make safe, evidence-based prescribing decisions in time-critical scenarios, underpinned by robust pharmacological knowledge and structured clinical assessment frameworks. It illustrates core competencies of independent prescribing practice: clinical reasoning under uncertainty, systematic risk–benefit analysis, medicines optimisation, and effective multidisciplinary communication.

Key points

- Invasive meningococcal disease (IMD) is a life-threatening medical emergency requiring immediate clinical recognition and urgent treatment without delay for confirmatory diagnosis
- Early symptoms may be non-specific; red flags including a non-blanching purpuric rash, photophobia, and severe headache should trigger immediate assessment and empirical antibiotic therapy
- First-line management is intravenous ceftriaxone 2 g every 12 hours, consistent with NICE NG240; a systematic allergy, contraindication, and interaction screen must be completed prior to prescribing
- IMD is a notifiable disease; prompt UKHSA notification, contact tracing, and chemoprophylaxis with ciprofloxacin 500 mg as a single oral dose for close contacts are essential public health responsibilities
- Vaccination is the most effective prevention strategy and should be offered to unvaccinated patients as part of discharge planning
- This case highlights a growing evidence base supporting both the expanding role of NMPs and a closing of the gap between pre-hospital and in-hospital prescribing necessary in time-critical conditions; good governance processes will ensure this is a safe, effective and timely intervention for patients with suspected IMD

CPD reflective questions

- What early signs and symptoms would prompt you to suspect IMD, and how confident are you in recognising a non-blanching rash across different skin tones?
- How confident are you in initiating emergency antibiotic treatment before diagnostic confirmation in time-critical cases, and how do you weigh the risks of delay against diagnostic uncertainty?
- What steps would you take to ensure effective communication when transferring a patient with suspected IMD, particularly regarding antibiotic timing and the need for adjunctive dexamethasone?
- How does your prescribing practice align with national guidelines for IMD management, including public health responsibilities such as notification, contact tracing, and chemoprophylaxis?
- What further training or support would help you feel more prepared to manage suspected cases of IMD within your scope of prescribing practice?

Conclusions

We have shown the effective management of confirmed IMD serogroup C through prompt clinical recognition and early evidence-based prescribing. Rapid initiation of IV ceftriaxone 2 g 12-hourly, guided by NICE recommendations and supported by robust systematic review evidence, was central to achieving full symptom resolution within 10 days. The case reinforces that antimicrobial therapy must not be delayed

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pending diagnostic confirmation; that systematic safety screening is essential prior to prescribing in emergency presentations; and that public health notification and contact chemoprophylaxis are integral components of medicines management in notifiable infections.

The absence of CSF analysis and PCR confirmation is acknowledged as a diagnostic limitation; where clinically feasible, laboratory confirmation of serogroup and antimicrobial susceptibility should be sought.

The case also highlights the interface between pre-hospital and in-hospital treatment pathways. While frontline paramedic practice, guided by JRCALC, currently supports the administration of benzylpenicillin for suspected IMD, this approach may not fully align with contemporary evidence-based management.

In this instance, the evidence suggests that earlier administration of ceftriaxone with adjunctive dexamethasone would have been both clinically appropriate and within paramedic competence, were these agents incorporated into JRCALC clinical guidelines. This case is therefore presented not only as a clinical account of IMD management, but also as a contribution to the evidence base supporting updates to JRCALC and local trust formularies to include these time-critical interventions in pre-hospital care. This case contributes to the growing evidence base supporting the expanding role of NMPs in time-critical conditions, and underscores the importance of continuous professional development, engagement with national guidelines, and reflective clinical practice. **JPrP**

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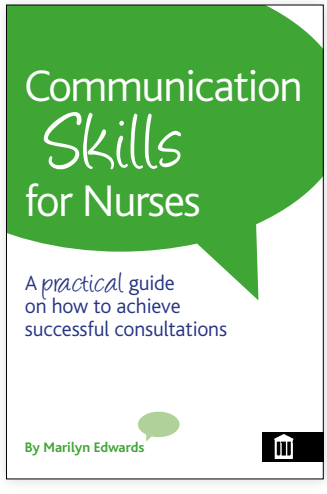
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