

The need for skin preparation prior to injection: point – counterpoint

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Abstract

Current recommendations to discontinue routine pre-injection skin preparation may jeopardise patient safety and increase the risk of infection. However, the best available evidence and theoretical rationale may offer sufficient support for recommendations to abandon this practice. Both sides of this argument are explored in this 'point-counterpoint' review.

Introduction – Professor Robert J Pratt

Guidance for skin preparation prior to needle injections has changed over the last decade. Previously, nurses and other healthcare providers routinely disinfected the skin prior to subcutaneous and intramuscular injections. This was usually accomplished by wiping the injection site with a 70 per cent isopropyl alcohol-saturated swab, eg Sterets Pre-Injection Swabs™, and allowing the disinfectant to dry. However, the need for this practice has long been questioned and the World Health Organization (WHO) and its Safe Injection Global Network (WHO-SIGN) no longer recommend swabbing clean skin with a disinfectant before giving intradermal, subcutaneous, and intramuscular needle injections (Hutin Y et al. 2003).

Current guidance in the UK from the Royal College of Paediatrics and Child Health, the RCN, the Royal College of General Practitioners and the Community Practitioners' and Health Visitors' Association now recommend that, other than ensuring that the injection site is visibly clean, it is unnecessary to disinfect the skin before administering immunisations (Royal College of Paediatrics and Child Health, 2002).

Many NHS trusts in the UK no longer recommend skin preparation prior to giving injections, but anecdotal reports suggest that many healthcare providers routinely use Sterets Pre-Injection Swabs™ for skin preparation before giving injections regardless of Trust guidelines. However, the current state of NHS trust guidance and its impact on clinical practice is unknown.

Some observers, concerned over the increasing rates of healthcare-associated infections (HCAI) in NHS trusts, have questioned the quality of the evidence base that informed the WHO-SIGN and UK guidance and wonder if the decision to abandon pre-injection skin preparation is putting patients at risk of infection.

In this point-counterpoint article, Professor Fenton F Robb will discuss the evidence-base for current recommendations and make the point that advice on pre-injection skin preparation is being misunderstood and/or misinterpreted and may jeopardise patient safety. Peter Hoffman will then make the counterpoint in which he will discuss the evidence for current recommendations and describe theoretical, observational and consensus considerations.

Point – Professor Fenton F Robb

Could the termination of skin preparation before injections be a factor in the transmission of HCAI?

As described above, previous practice and WHO (1995) guidelines recommended routine pre-injection skin disinfection. However, in 1993 investigators at the Public Health Laboratory Service (PHLS) in London (now incorporated into the Health Protection Agency) questioned this practice and reported that there was evidence that giving an injection without prior cleaning was not associated with increased infection risk in young, healthy individuals (Ayliffe et al. 1993) (see Box 1). The PHLS continued to recommend pre-injection skin preparation for older and ill patients, and those whose immune systems had been compromised, and for cannulation procedures, intra-articular injections and venesection.

In 2001 Peter Hoffman at the PHLS commented in an article on skin disinfection and acupuncture that the need for disinfection was controversial and that there was no specific research on this subject. He further observed that many UK hospitals had already discontinued pre-injection skin preparation without any adverse effects (Hoffman, 2001). No reports of the conditions or the effects of these experiments seem to have been submitted for peer review.

Given that some infections have lengthy incubation periods and that a high proportion of patients leave hospital within a few days, the validity of negative conclusions drawn from comparatively small samples over short periods could be questioned, especially as post-discharge infection surveillance is carried out very infrequently (National Audit Office, 2004).

In a position statement on injection technique (Royal College of Paediatrics and Child Health, 2002), the Royal Colleges of Paediatrics and Child Health, Nursing, General Practitioners and the Community Practitioners' and Health Visitors' Association assessed the incidence of injection-related infection, as indicated by abscesses at the injection site. They concluded that a reasonable estimate was of the order of one abscess per one or two million injections and noted that this was undoubtedly an underestimate. They further remarked that more and more people have abandoned skin preparation, other than making sure it is clean, prior to immunisation and there has been no sudden upsurge in abscess formation.

On the strength of this, they recommended that formal skin disinfection was not necessary before administering immunisations. However, they ignored the possibility that there may be infection without abscess at the injection site and they made no warning about vulnerable patients. Consequently, some practitioners take this advice to apply to all kinds of injection, not just to immunisation, and even to more invasive procedures.

Box 1. Public Health Laboratory Service (Ayliffe et al, 1993)

The necessity to disinfect the site with 70 per cent ethanol or 60-70 per cent isopropanol prior to injection is controversial. There is evidence that giving an injection without prior cleaning is not associated with increased infection risk in young, healthy individuals and it is not recommended for routine insulin injections in diabetic patients, because of potential damage to the skin.

Some hospitals have given up the use of alcohol before giving injections and no adverse effects have been reported. It is still used (usually with chlorhexidine) before cannulation procedures, intra-articular injections and taking blood cultures.

However, disinfection of the injection site continues to be used in most hospitals, particularly for injections in the thigh, and in elderly or immunocompromised patients, or close to infected or colonised lesions.

The area should be wiped thoroughly and allowed to dry before giving the injection. This will remove or kill most transient organisms.

As described in the introduction to this article, the WHO recently updated its guidelines on best infection control practice for injections and now advise that swabbing of (visibly) clean skin before giving an injection is unnecessary (Hutin et al, 2003). WHO-SIGN described its recommendations as being evidence based. However, they were only based on expert consensus and theoretical rationale and not supported by well-designed experimental or epidemiological studies, nor by theoretical rationale and suggestive, descriptive evidence. So, such evidence as was examined was actually rejected as insufficient in quality to support their recommendation. Other investigators frequently overlook this important qualification to their evidence.

Non-sterile sharps are considered to be a cause of HCAI. Should a sterile needle touch a non-sterile surface, it is advised that it should not be used. The unprepared skin of a patient is a non-sterile surface. Peter Hoffman in his paper (Hoffman, 2001) argues that a sterile needle is unlikely to be capable of inserting a sufficient number of bacteria as to produce infection at the injection site. The significance of 'unlikely' in the context of billions of injection events worldwide annually should be weighed carefully. Infection other than at the injection site and by *Staphylococcus aureus* seem to have been overlooked.

It is advised that careful attention be given to washing patients colonised or infected with methicillin-resistant *Staphylococcus aureus* (MRSA); yet it appears that no similar advice is given in respect of patients otherwise infected, nor is any suggestion made that the skin of MRSA-colonised patients should be prepared before an injection.

All the papers cited by Ayliffe and colleagues (1993) and in the report by the RCPC (2002) pre-date the increasing problem of HCAI. There are no hard data about the consequences of progressive termination of skin preparation prior to injection, but this process has coincided with the increase incidence of HCAI. The possibility that there could be a contributory causal relationship should not be ignored.

The point that advice on pre-injection skin preparation is being misunderstood and/or misinterpreted and that clinical practice may be drifting dangerously has been made. Therefore, the topic should be revisited.

Counterpoint – Peter N Hoffman

Good evidence is a rare and valuable commodity in infection control. Individual events that may give rise to, or prevent infection in hospitals can rarely be disentangled from the great number of other

events that may or may not have affected the situation. The debate on the importance of skin preparation before routine injection illustrates one of the classic dilemmas of infection control: what to do when the evidence base is lacking, unclear or open to differing interpretations. I will address this in three parts: theoretical considerations, observations and consensus.

Theoretical considerations

It is impossible to sterilise living skin. Chemical disinfectants will only reduce microbial numbers, for example, a five-second application of isopropanol will reduce numbers on the skin surface by 82-91 per cent (Kovisto and Felig, 1978).

However, a substantial proportion of skin bacteria are hidden under the surface in ducts, glands and follicles, probably around 20 per cent of the total (Selwyn and Ellis, 1972), and will be protected from disinfection, but will be available for inoculation into deeper tissues by syringe needles.

In experiments using medical student volunteers in the 1950s, *Staphylococcus aureus* derived from an abscess was inoculated into their skin in various ways (Elek and Conen, 1957). When injected into skin it needed high numbers, around 7.5 million organisms to produce an infection. *Staphylococcus aureus* is a common inhabitant or contaminant of normal skin. If the bacterial skin population were about 1 million organisms cm² (Noble, 1981) and a 23 gauge needle of cross-sectional area 0.32mm² produced a bacterial inoculation equivalent to its whole cross-section, around 3,200 organisms would be deposited in the needle's path.

This scenario uses assumptions generously biased towards infection: a high bacterial population on the skin, the assumption that all or the majority are *Staphylococcus aureus* (most would be far less pathogenic species) and that all bacteria in the needle's path would be carried into deeper tissue layers. This still results in inoculation of less than 0.05 per cent of the numbers needed to initiate an infection. It should be noted that the same researchers found that when non-self material was present in a suture placed in the skin, this compromised host immunity such that 100 *Staphylococcus aureus* cells could initiate infection. This illustrates the real value of skin preparation pre-operatively or before insertion of a peripheral or central venous or arterial catheter.

Observations in practice

In the 1960s a university medical officer called TC Dann abandoned pre-injection skin preparation unless the injection site was visibly soiled (1969). Experience of over 5,000 injections in students, university staff (not just academic staff) and their families (age range four months to 66 years) over six years showed no resulting infections. A letter in *The Lancet* in response to this (Turner, 1969) shared the author's experience of the lack of infection during 30 years of injections without prior skin preparation both in the UK and a Himalayan population, 'which had never washed since birth'. Unfortunately in both these studies there was no structured follow-up.

There has been a small trial (Sutton et al, 1999) of alcohol swab (93 patients) versus no pre-treatment (103 patients) before venesection, with follow-up observations at one, three and five days. Although two patients developed an abscess at the venesection site (both of these were in the alcohol swab group and both were on long-term steroid therapy), there was no statistically-significant difference between the two groups.

Consensus

The *Martindale pharmacopoeia* (1999) published by the Royal Pharmaceutical Society states: 'The need to disinfect the skin before injection is controversial. Routine skin preparation of the injection site has been reported to be both ineffective and unnecessary.' Although changes in skin preparation policy are rarely made public, there are exceptions. In 1985 Nottingham City Hospital reported (Anon, 1985) that: 'Skin preparation before intramuscular and sub-

cutaneous injections has been discontinued without any adverse effects.' Other hospitals have introduced similar changes, but without such announcements. One such reported (Liew and Archer, 1995) that it can be difficult to interrupt a well-established ritual – eight years after a policy decision to cease routine pre-injection skin swabbing, 78 per cent of staff surveyed at a UK hospital continued the practice. The main reason given by those continuing was 'sterilisation' (52 per cent).

Reflection

It is difficult to see how 'unsafe' injections can lead to a general increase in HCAI. As the transmission of bloodborne viruses from one patient to another is not at issue here, this leaves consideration of bacterial infections from either the patients own or transiently-acquired microflora. This would usually result in abscesses at the site of injection. There has been no report of such abscesses generally associated with routine injections either with or without skin preparation.

Most infection in hospital is either of the urinary tract, surgical wounds, lower respiratory tract or ulcers. Septicaemias are generally associated with patients 'invaded' by indwelling medical devices (where I would consider rigorous skin preparation essential).

I do not wish to say that skin preparation before routine injections is a harmful nor a particularly wasteful practice. It is however one of those practices whose origins are uncertain and whose continuation cannot be justified by theory, observation or consensus but, as usual, more research would not go amiss.

Conclusion – Professor Robert J Pratt

Everyone involved in the provision of health care and patient safety is concerned with the unacceptable current rates of preventable HCAI.

The introduction of healthcare governance in the mid-1990s has provided a framework for continuous quality improvement. At the very heart of clinical governance is the concept of clinical effectiveness, ie that clinical decisions and practice are based upon the best evidence of efficacy (Pratt et al, 2002).

Professor Robb has made the point that the evidence-base upon

which recommendations were made by both WHO-SIGN (Hutin et al, 2003) and the Royal College of Paediatrics and Child Health (2002) were based on weak evidence. Peter Hoffman counters this point with theoretical considerations and with observations and consensus in practice.

Infection prevention and control interventions are of necessity based on diverse types of evidence. Because good quality randomised clinical trial (RCT) evidence is often lacking within the arena of infection prevention and control, practitioners and clinical decision-makers need to use the best available evidence, which is not necessarily the best evidence possible. Expert opinion and consensus, along with observational studies, are acceptable evidence and need to be appraised and used when stronger evidence is lacking.

Although current guidance (see Box 1) does not recommend pre-injection skin disinfection in young, healthy individuals with visibly clean skin, it does recommend skin disinfection for injections into the thigh, and in elderly or immunocompromised patients, or injections close to infected or colonised lesions, ie a significant number of hospital patients.

Professor Robb makes the point that a 'practice drift' may occur where current recommendations are being misunderstood and misinterpreted, resulting in pre-injection skin disinfection not being appropriately practised as recommended.

Practitioner response

Both Professor Robb and Peter Hoffman suggest that further research would be useful. Do you, the practitioner, feel this is necessary or is there adequate evidence to support current recommendations (see Box 1)?

Having reflected on the point and counterpoint here, what is your opinion on the clinical necessity for pre-injection skin disinfection? What do your local guidelines recommend and what actually occurs in practice in your clinical environment? Do you agree with current recommendations and, if so, are they being correctly understood and interpreted by staff or has a practice drift occurred?

The point and counterpoint have been made. As the practitioner, what do you think?

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