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Review

Safety of the reuse of needles for subcutaneous insulin injection: A systematic review and meta-analysis

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ABSTRACT

Objective: Many people with diabetes often reuse disposable needles for subcutaneous insulin injection. We aimed to identify, critically appraise and summarize the available evidence about the safety of this practice.
Design: Systematic review in accordance with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses statement.
Data sources: MEDLINE (via PubMed), CINALH (via EBSCO), SCOPUS, Web of Science, Cochrane Central Register of Controlled Trials and Open Grey were searched from their inception to December 2015, with no language restrictions.
Review methods: Epidemiologic and experimental studies assessing adverse effects of reusing needles in people of any age or sex, with or without diabetes, were included. Two reviewers independently assessed the methodological quality of included studies using a multi-design tool.
Results: In total, 25 studies were included. All studies had a high risk of bias and data from only nine studies could be pooled. Five studies showed no association between infection at site of injection and reuse of needles (risk difference = −0.00; 95% confidence interval = −0.12–0.11; $P = 0.99$); heterogeneity between these studies was substantial ($I^2 = 66\%$; $P = 0.02$). Five cross-sectional studies showed an association between lipohypertrophy and needle reuse (risk difference = 0.16, 95% confidence interval = 0.05–0.28, $P = 0.006$); there was strong evidence of heterogeneity between these studies ($I^2 = 87\%$; $P < 0.001$). Pooled data of two studies with no evidence of heterogeneity between them showed more perceived pain among reusers (risk difference = 0.24; 95%

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confidence interval = 0.06–0.43; $P = 0.006$). Reusing a pen needle or disposable syringe-needle was not associated with worse glycaemic control.
Conclusions: There is currently no clear scientific evidence to suggest for or against the reuse of needles for subcutaneous insulin injection. This practice is very common among people with diabetes; consequently, further research is necessary to establish its safety.

What is already known about the topic?

- Experts as well as manufacturers advise against the reuse of insulin needles.
- Many people with diabetes often reuse disposable insulin needles.
- Reusing needles could lead to major cost savings if safety were established.

What this paper adds

- There is no strong evidence to suggest for or against the reuse of insulin needles.
- More high-quality research is needed to determine the risks of insulin needle reuse.

1. Introduction

The advent of the disposable syringe-needle was a turning point in the method of administering insulin, which until then was injected by devices that must be sterilized after each use. These new disposable devices have generated controversies in the health sector with regard to their cost, appropriateness, and accuracy. One of the most controversial issues was the reuse of these devices (Bloom, 1985; Dudley Hart, 1988; Fawbush, 1984; Greenough et al., 1979). At present, in most developed countries over 80% of people with diabetes use insulin pens; in Russia and the United States of America (USA), a lower percentage of patients use these devices (67.8% and 43.7%, respectively), with the remainder continuing to use disposable syringe-needles (De Coninck et al., 2010). However, considerable controversy remains about the reuse of disposable devices, especially regarding needle reuse.

Diabetes-related institutions, associations and experts as well as manufacturers advise against the reuse of needles for subcutaneous insulin injection, arguing a possible relationship with numerous health risks, including infection, cutaneous lipodystrophy, more painful punctures and loss of accuracy in insulin dose administration (American Diabetes Association, 2004; Deutschen Gesellschaft fur Krankenhaushygiene (DGKH), 2011; King, 2003; Loczenski, 2011). Furthermore, the international best practice document for insulin administration recommends not reusing needles due to its association with lipohypertrophy, although the same document mentions the lack of conclusive scientific evidence of the risks of reuse (Frid et al., 2010). However, many people with diabetes often reuse needles. An international study shows that users of disposable syringe-needle devices reuse needles an average of 3.3 times and users of insulin pen devices an average of 3.6 times, noting that 26.6% of users of insulin pens reuse needles more than five times (De Coninck et al., 2010).

These disagreements between expert recommendations and real-world practice have led to studies that call into question these recommendations and their rationale (Berger et al., 2004; Puder et al., 2005). If patient safety were established, reusing needles could lead to significant cost savings, estimated at about 100 million euros annually in Europe (Puder et al., 2005). Moreover, loss of manual dexterity is a common problem among people with diabetes (Yang et al., 2015), so the assembling and the disassembling of a needle device may present a difficulty. If assembly could be done, for example, every five administrations rather than each time, this barrier would be diminished.

In this context and in view of the potential benefits and the possible harms of reusing needles for insulin administration, this systematic review aimed to identify, critically appraise and summarize the available scientific evidence on its safety.

2. Methods

We performed a systematic review of the literature according to the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) statement (Moher et al., 2009). The review protocol is available in the International Prospective Register of Systematic Reviews (PROSPERO) with the registration number CRD42013005161.

2.1. Eligibility criteria

Studies were selected according to the following criteria.

2.1.1. Study designs

We included epidemiologic (cross-sectional, cohort or case-control) and experimental studies. Case studies, case series and qualitative studies were excluded.

2.1.2. Participants and setting

The target population consisted of people of any age or sex, with or without diabetes. We included all studies conducted in any setting (inpatients or outpatients) in which the injection was self-administered by the patient or was administered by a health care professional.

2.1.3. Exposure

The exposure was the reuse of insulin pen needles and disposable insulin syringe-needles.

2.1.4. Outcomes

We only included studies that analysed the association of reusing needles with any adverse effects, mainly signs of