

Disposable IV Cannula Assembly

FIELD OF INVENTION

The present invention relates broadly to a disposable IV cannula assembly and to a method of using a disposable IV cannula assembly.

BACKGROUND

Disposable medical devices are used for a large variety of patient treatments, for example in hospitals. While the disposal of devices as opposed to re-use of devices significantly reduces the risk of cross-contamination of patients caused by insufficiently sterilized medical devices, the disposable devices themselves can become a hazardous waste product.

An intravenous (IV) cannula typically consists of a needle tube surrounded by a catheter tube mounted onto a catheter hub. The catheter hub in turn engages with a needle hub, at which a luer may be received, for introduction of fluid into the patient via the catheter tube, after intravenous insertion utilising the needle tube, which is subsequently removed. Optionally, an injection port, mounting wings, or both, may be provided on the catheter hub.

Often, the needle tube together with the needle hub are removed from the catheter tube and catheter hub, with the catheter tube and catheter hub remaining attached to a patient for e.g. a number of days. Upon removal of the needle hub and needle tube, it is desirable to cover the needle tube so as to avoid or reduce the likelihood of accidents, which could have severe consequences such as transmission of viruses from the patient to persons handling the needle hub and tube.

A number of designs for disposable IV cannula have been proposed, which provide needle covers that engage with the needle hub in an initial assembled stage, i.e. with the needle tube and needle hub engaged with the catheter tube and catheter hub, as well as after use, i.e. when the needle hub and needle tube are removed from the catheter tube and catheter hub.

In such existing designs, a problem is often associated with the fact that on the one hand the removal of the needle cover should be "easy" enough so as to not interfere with the initial removal of the needle cover for use of the IV cannula, but at the same time "difficult" enough to provide a desired degree of protection once the needle cover has been engaged with the needle hub after removal of the needle hub and needle tube from the catheter hub and catheter tube. Since the engagement with the needle hub is the same for the initial assembled IV cannula and when the needle hub and needle tube are removed from the catheter hub and catheter tube, existing designs are inherently not optimized for inhibiting removal of the needle cover after use for increased protection.

A need therefore exists for providing an alternative disposable IV cannula design that seeks to address the above-mentioned problem.

SUMMARY

In accordance with a first aspect of the present invention there is provided a disposable IV cannula assembly comprising a needle tube attached to a needle hub; a catheter tube attached to a catheter hub, the catheter hub arranged for releasable engagement with the needle hub in a first assembled state; and a needle cover arranged, in the first assembled state, for direct releasable engagement with the catheter hub, and, in a second assembled state, in which the needle hub is disengaged from the catheter hub, for engagement with the needle hub.

The needle cover may be arranged, in the second assembled state, for substantially locked engagement with the needle hub.

The needle cover may comprise an engagement portion at one end, and a tube portion extending from the engagement portion.

The engagement portion may comprise two prongs extending from a base, the prongs defining a receptacle therebetween for receiving the catheter hub or the needle hub.

Each prong may comprise a connecting element for co-operation with a corresponding connecting element of the needle hub for engagement in the second assembled state.

The connecting elements may each be in the form of a through-hole in the prong, and the corresponding connecting elements of the needle hub each comprise a catch.

Each catch may comprise a substantially perpendicular surface, with respect to an assembling direction, at one end, for engagement with a wall of the corresponding respective through-holes in a direction opposite to the assembling direction.

Each catch may comprise a substantially slanting surface at an opposite end.

The engagement portion of the needle cover may comprise one or more stopper protrusions for abutting with the needle hub in the second assembled state.

An inner surface of the tube portion of the needle cover adjacent the engagement portion of the needle cover may be arranged for a press-fit engagement with a front portion of the catheter hub in the first assembled state.

The inner surface of the tube portion may comprise one or more protrusions for a press-fit engagement with the front portion of the catheter hub in the first assembled state.

The catheter hub may comprise an injection port.

The catheter hub may comprise an injection port cap.

The catheter hub may comprise mounting wings.

The needle hub may comprise a luer port.

The catheter hub may comprise a luer cap.

In accordance with a second aspect of the present invention there is provided a method of using a disposable IV cannula assembly, the method comprising the steps of disengaging a needle cover of the assembly from a direct releasable engagement in a first assembled state, in which a needle hub of the assembly is engaged with a catheter hub of the assembly, of the needle cover with the catheter hub; and engaging the needle cover, in a second assembled state in which the needle hub is disengaged from the catheter hub, with the needle hub.

The needle cover may, in the second assembled state, substantially be in locked engagement with the needle hub.

BRIEF DESCRIPTION OF THE DRAWINGS

Embodiments of the invention will be better understood and readily apparent to one of ordinary skill in the art from the following written description, by way of example only, and in conjunction with the drawings, in which:

Figure 1 is a line drawing of a disposable IV cannula assembly according to an example embodiment.

Figure 2 is a perspective drawing of the disposable IV cannula assembly of Figure 1 in a first assembled state prior to use.

Figure 3 is a perspective drawing of the disposable IV cannula assembly of Figure 1 in a second assembled state for disposal.

Figure 4 is a line drawing of a disposable IV cannula assembly according to an example embodiment.

Figure 5 is a perspective drawing of the disposable IV cannula assembly of Figure 4 in a first assembled state prior to use.

Figure 6 is a cross-sectional drawing of the disposable IV cannula assembly of Figure 4 in the first assembled state.

Figure 7 is a perspective drawing of the disposable IV cannula assembly of Figure 4 in a second assembled state for disposal.

DETAILED DESCRIPTION

Figure 1 shows a line drawing of components of an IV cannula assembly 100 according to an example embodiment. The assembly 100 comprises a needle cover 102, a catheter tube 104 attached to a catheter hub 106, and a needle tube 108 attached to a needle hub 110. The needle cover 102 comprises an engagement portion 112, which in turn comprises two prongs 114, 116 defining a receiving space 118 there between. Stopper protrusions 120, 122 are also provided at the engagement portion 112.

In the example embodiment, the catheter tube 104 is formed separately from the catheter hub 106. More particular, the catheter tube 104 comprises a base member (not shown) and is inserted from a front end 107 of the catheter hub 106. The base element of the catheter tube 104 sealingly engages an internal surface of the catheter hub 106 in the fully inserted state, with the catheter tube 104 extending through an opening 109 in the catheter hub 106.

When the IV cannula assembly 100 is in its initial assembled state prior to use, as shown in Figure 2, the engagement portion 112 engages the catheter hub 106 by receiving the front portion 124 (Figure 1) in the needle cover portion 126 adjacent the engagement portion 112, in a press-fit engagement. The internal dimensions of the needle cover portion 126 are chosen so as to accommodate the front portion 124 (Figure 1) of the catheter hub 106, but so as to be smaller than a conically shaped mid portion 128 (Figure 1) of the catheter hub 106, thus limiting insertion of the catheter hub into the needle cover 102.

Returning to Figure 1, in the example embodiment, the dimensions of the engagement portion 112 in conjunction with the dimensions of the catheter hub 106 are chosen such that in the initial assembled configuration, i.e. with the needle hub 110 and needle tube 108 received in the catheter hub 106 and catheter tube 104, the prongs 114, 116 do not reach protruding catches 130, 132 of the needle hub 110. Thus, no direct engagement between the engagement portion 112 and the needle hub 110 occurs in that configuration.

At the same time, the needle hub 110 is press fit into engagement with the catheter hub 106 by way of protruding deformable portions e.g. 134 at the base of the catheter hub 106, which are received in a substantially circular receptacle portion 136 of the needle hub 110. A luer cap 138 is also provided for press-fitted engagement with a luer opening 140 of the needle hub 110.

As will be appreciated by a person skilled in the art, the needle cover 102 can thus be conveniently removed from the initial assembly by working against the press-fit engagement between the front portion 124 of the catheter hub 106 inside the needle cover portion 126. The needle cover portion 126 may have one or more deformable protrusions on an inside surface thereof to facilitate the press-fit engagement with the front portion 124 of the catheter hub 106.

On the other hand, Figure 3 shows the engagement of the needle cover 102 with the needle hub 110 after the needle hub 110 and needle tube 108 have been removed from the catheter hub and catheter tube. More particularly, the protruding catches 130, 132 are received in openings e.g. 200 formed on side surfaces of the prongs e.g. 116 of the engagement portion 112 of the needle cover 102. As will be appreciated by the person skilled in the art, because of the slanting front surface e.g. 202 of the catches e.g. 130, the prongs e.g. 116 are resiliently deformed to receive the catches e.g. 130 during insertion. The resiliently deformed prongs e.g.

116 "snap" back to receive the catches e.g. 130 within the opening e.g. 200. As will further be appreciated by the person skilled in the art, the substantially perpendicular back surfaces e.g. 204, with respect to the needle tube 108, of the catches e.g. 130 inhibit removal of the needle cover 102 after engagement, thus providing an substantially "locked" engagement between the needle cover 102 and the needle hub 110 for safe disposal of the IV cannula after use.

As illustrated in Figure 3, in the "locked" engagement, the stopper protrusions e.g. 120 abut the receptacle portion 136 of the needle hub 110. This assists in preventing "over-insertion" of the needle hub into the receiving portion 112, which may lead to disengagement of the catches e.g. 130 from within the openings e.g. 202 of the prongs e.g. 116.

The embodiment described above with reference to Figures 1, 2 and 3 thus provides an IV cannula arrangement in which an initial engagement of the needle cover 102 and the catheter hub 106 is of a press-fit type, but not a locking engagement, whereas the engagement between the needle cover 102 and the needle hub 110 for disposal is of a locking type.

Figure 4 shows a line drawing of components of an IV cannula assembly 300 according to another example embodiment. The assembly 300 comprises a needle cover 302, a catheter tube 304 attached to a catheter hub 306, and a needle tube 308 attached to a needle hub 310. The catheter hub 306 comprises an injection port 307 into which an injection port cap 309 can be press-fitted. The catheter hub 306 further comprises wings 311 and 313 for facilitating attachment and positioning of the catheter hub 306 on a patient. In use, the wings 311, 313 e.g. abut the skin of the patient directly. The wings 311, 313 may e.g. be taped onto the skin of the patient, or may be stitched onto the skin of the patient utilising openings e.g. 315.

The needle cover 302 comprises an engagement portion 312, which in turn comprises two prongs 314, 316 defining a receiving space 318 there between. Stopper protrusions 320, 322 are also provided at the engagement portion 312. When the IV cannula assembly 300 is in its initial assembled state prior to use, as shown in Figure 5, the engagement portion 312 engages the catheter hub 306 by receiving the front portion 324 (Figure 4) in the needle cover portion 326 adjacent the engagement portion 312, in a press-fit engagement.

Figure 6 shows a cross-sectional view of the IV cannula assembly 300. A plurality of ribs e.g. 600 are provided on an internal surface of the needle cover

portion 326, which deform for a press-fit engagement with the front portion 324 of the catheter hub 306 (Figure 4).

The internal dimensions of the needle cover portion 326 are chosen so as to accommodate the front portion 324 of the catheter hub 306 (Figure 4), but so as to be smaller than a conically shaped mid portion 328 (Figure 4) of the catheter hub 306 (Figure 4), thus limiting insertion of the catheter hub 306 (Figure 4) into the needle cover 302 (Figure 4).

Returning to Figure 4, in the example embodiment, the dimensions of the engagement portion 312 in conjunction with the dimensions of the catheter hub 306 are chosen such that in the initial assembled configuration, i.e. with the needle hub 310 and needle tube 308 received in the catheter hub 306 and catheter tube 304, the prongs 314, 316 do not reach protruding catches 330, 332 of the needle hub 310. Thus, no direct engagement between the engagement portion 312 and the needle hub 310 occurs in that configuration. The injection port 307 and injection port cap 309 are accommodated in the receiving space 318 between the prongs 314 and 316.

The needle hub 310 is, however, press-fit into engagement with the catheter hub 306 by way of protruding deformable portions e.g. 334 at the base of the catheter hub 306, which are received in a substantially circular receptacle portion 336 of the needle hub 310. A luer cap 338 is also provided for press-fitted engagement with a luer opening 340 of the needle hub 310.

As will be appreciated by a person skilled in the art, the needle cover 302 can thus be conveniently removed from the initial assembly by working against the press-fit engagement between the front portion 324 of the catheter hub 306 inside the needle cover portion 326..

On the other hand, Figure 7 shows the engagement of the needle cover 302 with the needle hub 310 after the needle hub 310 and needle tube 308 have been removed from the catheter hub and catheter tube. More particularly, the protruding catches e.g. 330 are received in openings e.g. 400 formed on side surfaces of the prongs e.g. 316 of the engagement portion 312 of the needle cover 302. As will be appreciated by the person skilled in the art, because of the slanting front surface e.g. 402 of the catches e.g. 330, the prongs e.g. 316 are resiliently deformed to receive the catches e.g. 330 during insertion. The resiliently deformed prongs e.g. 316 "snap" back to receive the catches e.g. 330 within the opening e.g. 400.

As will further be appreciated by the person skilled in the art, the substantially perpendicular back surfaces e.g. 404, with respect to the needle tube 308, of the catches e.g. 330 inhibit removal of the needle cover 302 after engagement, thus providing an substantially "locked" engagement between the needle cover 302 and the needle hub 310 for safe disposable of the IV cannula after use. The needle hub 310 also comprises a wall 406 for facilitating prevention of a finger of a person gripping the needle hub 310 slipping onto the needle tube 308.

As illustrated in Figure 7, in the "locked" engagement, the stopper protrusions e.g. 320 abut the receptacle portion 336 of the needle hub 310. This assists in preventing "over-insertion" of the needle hub into the receiving portion 312, which may lead to disengagement of the catches e.g. 330 from within the openings e.g. 402 of the prongs e.g. 316.

The embodiment described above with reference to Figures 4 to 7 thus provides an IV cannula arrangement in which an initial engagement of the needle cover 302 with the catheter hub 306 is of a press-fit type, but not a locking engagement, whereas the engagement between the needle cover 302 and the needle hub 310 for disposal is of a locking type.

Table 1 summarises example materials used for the various components of the IV cannula assembly in example embodiments.

NEEDLE COVER	CATHETER TUBE	CATHETER HUB NEEDLE HUB	LUER CAP	INJECTION PORT CAP	NEEDLE TUBE
PE	PTFE	PC	PP	PP	Stainless steel of medical grade
PP	PP	PP	PE	PVC	
PVC	PE	PVC	PVC	PE	
	PU	PE			

Table 1

where:

PE – polyethylene

PP – polypropylene

PVC – polyvinylchloride

PTFE – polytetrafluoroethylene

PU – polyurethane

PC – polycarbonate

The plastic components of the IV cannula assembly in example embodiments may e.g. be manufactured by injection molding, extrusion molding, or blow molding. The needle tube may e.g. be manufactured by forming a stainless steel sheet into a

tubular form by bonding, stretching the tube to reduce the needle tube to a desired dimension, cutting the needle tube to a required length, and grinding a needle profile, followed by electro polishing and an ultrasonic washing, in an example embodiment.

It will be appreciated by a person skilled in the art that numerous variations and/or modifications may be made to the present invention as shown in the specific embodiments without departing from the spirit or scope of the invention as broadly described. The present embodiments are, therefore, to be considered in all respects to be illustrative and not restrictive.

CLAIMS

1. A disposable IV cannula assembly comprising:
a needle tube attached to a needle hub;
a catheter tube attached to a catheter hub, the catheter hub arranged for releasable engagement with the needle hub in a first assembled state; and
a needle cover arranged, in the first assembled state, for direct releasable engagement with the catheter hub, and, in a second assembled state, in which the needle hub is disengaged from the catheter hub, for engagement with the needle hub.
2. The assembly as claimed in claim 1, wherein the needle cover is arranged, in the second assembled state, for substantially locked engagement with the needle hub.
3. The assembly as claimed in claims 1 or 2, wherein the needle cover comprises an engagement portion at one end, and a tube portion extending from the engagement portion.
4. The assembly as claimed in claim 3, wherein the engagement portion comprises two prongs extending from a base, the prongs defining a receptacle therebetween for receiving the catheter hub or the needle hub.
5. The assembly as claimed in claim 4, wherein each prong comprises a connecting element for co-operation with a corresponding connecting element of the needle hub for engagement in the second assembled state.
6. The assembly as claimed in claim 5, wherein the connecting elements are each in the form of a through-hole in the prong, and the corresponding connecting elements of the needle hub each comprise a catch.
7. The assembly as claimed in claim 6, wherein each catch comprises a substantially perpendicular surface, with respect to an assembling direction, at one end, for engagement with a wall of the corresponding respective through-holes in a direction opposite to the assembling direction.
8. The assembly as claimed in claims 6 or 7, wherein each catch comprises a substantially slanting surface at an opposite end.
9. The assembly as claimed in any one of claims 3 to 8, wherein the engagement portion of the needle cover comprises one or more stopper protrusions for abutting with the needle hub in the second assembled state.

10. The assembly as claimed in any one of claims 3 to 9, wherein an inner surface of the tube portion of the needle cover adjacent the engagement portion of the needle cover is arranged for a press-fit engagement with a front portion of the catheter hub in the first assembled state.

11. The assembly as claimed in claim 10, wherein the inner surface of the tube portion comprises one or more protrusions for a press-fit engagement with the front portion of the catheter hub in the first assembled state.

12. The assembly as claimed in any one of the preceding claims, wherein the catheter hub comprises an injection port.

13. The assembly as claimed in claim 12, wherein the catheter hub comprises an injection port cap.

14. The assembly as claimed in any one of the preceding claims, wherein the catheter hub comprises mounting wings.

15. The assembly as claimed in any one of the preceding claims, wherein the needle hub comprises a luer port.

16. The assembly as claimed in claim 15, wherein the catheter hub comprises a luer cap.

17. A method of using a disposable IV cannula assembly, the method comprising the steps of:

disengaging a needle cover of the assembly from a direct releasable engagement in a first assembled state, in which a needle hub of the assembly is engaged with a catheter hub of the assembly, of the needle cover with the catheter hub; and

engaging the needle cover, in a second assembled state in which the needle hub is disengaged from the catheter hub, with the needle hub.

18. The method as claimed in claim 17, wherein the needle cover is, in the second assembled state, substantially in locked engagement with the needle hub.