

A VIAL SAFETY CAP AND A RELATED VIAL

FIELD OF INVENTION

- 5 The invention relates to a vial safety cap and a related vial.

BACKGROUND

10 Injectable insulin therapy is one of the primary instances where human error takes place in the course of hospital care. Human error in the course of administering insulin has led to adverse consequences for patients, such as, for example, prolonged hospital stay, severe disability, and even death. Moreover, medical institutions also incur substantial legal costs to deal with malpractice issues, and have to deal with the provision of compensation costs to the patients.

15 Errors during injectable insulin therapy (commonly used in clinical practice) typically arise because insulin has a narrow therapeutic range requiring precise dose adjustments with careful administration and monitoring. A percentage of patients in the hospital who have diabetes mellitus may require insulin therapy during the course of their stay in the hospital.

20 Other than the narrow therapeutic range, a further issue with regard to injectable insulin therapy is the variety of insulin in various strengths/forms, coupled with a wide range of syringes.

In view of the aforementioned issues, inappropriate application of insulin therapy by medical professionals in a hospital occasionally results.

25 During the preparation of insulin for intravenous infusion, insulin is typically diluted. A common error relating to injectable insulin therapy is failure to use an appropriate insulin syringe. A potentially catastrophic error can arise when a wrong syringe is used to draw insulin as this can result in an excessive dose of insulin being delivered to patients, hence exposing them to health risks
30 even death.

Unfortunately, vials currently used to contain insulin allow access by both insulin syringes and regular syringes for the withdrawal of insulin from the vials. This ease of access allows errors to take place.

Thus, it is desirable if the likelihood of errors in relation to injectable insulin therapy is minimised/eradicated.

5 SUMMARY

The present invention provides a vial safety cap specifically configured for use with a specialised syringe, the safety cap including an engaging portion configured for coupling with a vial; and a receptor portion including a channel located at a pre-determined distance from the engaging portion, the channel being configured for allowing passage of a barrel of the syringe. It is advantageous that the receptor portion enables a needle of the syringe to pierce a cap of the vial. Advantageously, the safety cap also ensures that an appropriate syringe is used, prevents the use of wrong syringes, and aids in preventing needle stick mishaps when filling the syringe with medication.

It is preferable that the channel has a cross section such as, for example, U-shaped, V-shaped, circular and so forth. Preferably, the engaging portion couples with the neck using a mechanism such as, for example, a friction fit mechanism, a snap-fit mechanism, a magnetic mechanism and so forth. The pre-determined distance may be at least a length of the needle of the syringe, and may ensure that an enclosure is provided within the safety cap. It is also preferable that a length of the channel combined with the pre-determined distance is longer than a needle of a regular syringe.

It is preferable that the enclosure is configured to surround the needle of the syringe. Advantageously, the enclosure allows the cap of the vial to be cleaned prior to being pierced by the syringe.

25

The safety cap may further include a holding portion between the engaging portion and the channel and may be shaped in a configuration to prevent rolling on a flat surface.

The present invention also provides a vial specifically configured for use with a specialised syringe, the vial including a containment portion; and a receptor portion including a channel located at a pre-determined distance from the containment portion, the channel being configured for allowing passage of a barrel of the syringe. It is advantageous that the receptor portion enables a needle of the syringe to pierce a cap of the containment portion. Advantageously, the safety cap also ensures

30

that an appropriate syringe is used, prevents the use of wrong syringes, and aids in preventing needle stick mishaps when filling the syringe with medication.

Preferably, the pre-determined distance is at least a length of a needle of the syringe and ensures that an enclosure is provided within the vial. It is also preferable that the enclosure is configured to surround the needle of the syringe and allows the cap of the containment portion to be cleaned prior to being pierced by the syringe. A length of the channel combined with the pre-determined distance is preferably longer than a needle of a regular syringe.

The vial may further include a holding portion between the containment portion and the channel, and the vial may be shaped in a configuration to prevent rolling on a flat surface.

DESCRIPTION OF FIGURES

In order that the present invention may be fully understood and readily put into practical effect, there shall now be described by way of non-limitative example only preferred embodiments of the present invention, the description being with reference to the accompanying illustrative figures.

Figure 1 provides a perspective view of a first embodiment of the present invention.

Figure 2 provides a perspective view of the first embodiment during use.

Figure 3 provides a perspective view of a second embodiment of the present invention.

Figure 4 provides a perspective view of the second embodiment during use.

Figure 5 provides a perspective view a third embodiment of the present invention.

Figure 6 provides a close-up view of an example snap-fit mechanism for engaging a neck of a vial.

Figure 7 a photograph of the third embodiment during use.

Figure 8 shows a comparative view of insulin syringes and general syringes.

Figure 9 shows a perspective view of a vial integrated with a safety cap.

DESCRIPTION OF PREFERRED EMBODIMENTS

30

The present invention provides a vial safety cap for vials of insulin. Several embodiments of the vial safety cap will be described in the following paragraphs. Advantageously, the present invention ensures that an appropriate syringe is used, prevents the use of wrong syringes, and also aids in preventing needle stick mishaps when filling a syringe with the requisite medication stored in the

vial. It should be appreciated that while the vial safety cap is described with reference to use of vials of insulin, the vial safety cap can also be used with vials of other forms of medication.

Referring to Figure 1, there is shown a first embodiment of a vial safety cap 20 for vials of insulin.

5 The vial safety cap 20 is specifically configured for use with an insulin syringe. Referring to Figure 8, there is shown a plurality of insulin syringes 200 and a plurality of regular syringes 300. The vial safety cap 20 includes an engaging portion 22 configured for coupling with a vial 26, particularly with a neck 24 of the vial 26. When the engaging portion 22 can be varied, then the vial safety cap 20 can be coupled with vials 26 of different neck widths. The engaging portion 22 couples with the neck 24
10 using a snap-fit mechanism (as shown). Referring to Figure 2, there is shown sequential images of how the vial 26 is engaged with the engaging portion 22 of the vial safety cap 20 by moving the vial 26 towards the vial safety cap 20 (Figure 2(a)) and subsequently, the vial 26 is engaged with the engaging portion 22 of the vial safety cap 20 using the snap-fit mechanism (Figure 2(b)).

15 The vial safety cap 20 also includes a channel 28 defined by a receptor portion 29 located at a pre-determined distance from the engaging portion 22. The channel 28 is configured for allowing passage of a barrel 31 of a syringe 30, the syringe 30 being of the insulin syringe configuration. The channel 28 has a V-shaped cross-section and the pre-determined distance is at least a length of a needle of the insulin syringe 30. It should be noted that syringes which are bigger than a largest
20 insulin syringe are not usable with the vial safety cap 20 because of the channel 28. The pre-determined distance ensures that an enclosure 27 is provided within the vial safety cap 20 to allow removal of a seal from a cap of the vial 26. This ensures that a part of the vial 26 covered by the seal remains sterile. Furthermore the enclosure 27 also allows the cleaning of the cap of the vial 26 to avoid contamination of the cap of the vial 26. It should be noted that the receptor portion 29
25 ensures that a needle of the syringe 30 is able to enter the vial 26 when the syringe 30 is located within the channel 28. A length of the channel 28 combined with the pre-determined distance should be longer than a needle of a regular syringe 300. This ensures that regular syringes 300 are not able to draw insulin from the vial 26 when a barrel of regular syringes 300 does not fit within the channel 28.

30

Moreover, the enclosure 27 is also configured to surround a needle of the syringe 30 such that needle stick issues are prevented since a user's hand is protected by the vial safety cap 20.

Furthermore, the vial safety cap 20 also includes a holding portion 36 between the engaging portion 22 and the channel 28 which provides a greater surface area for gripping by the user for a more stable hold. In addition, the vial safety cap 20 is also shaped in a configuration to prevent rolling when the vial safety cap 20 is placed on a flat surface. This is convenient for users who engage the vial 26 to the vial safety cap 20 and subsequently leave the vial safety cap 20 on a flat surface like, for example, a table, a trolley, and so forth.

It should be appreciated that the vial safety cap 20 can be a single-use item.

Referring to Figure 3, there is shown a second embodiment of a vial safety cap 40 for vials of insulin. The vial safety cap 40 is specifically configured for use with an insulin syringe. The vial safety cap 40 includes an engaging portion 42 configured for coupling with a vial 46, particularly with a neck 44 of the vial 46. When the engaging portion 42 can be varied, then the vial safety cap 40 can be coupled with vials 46 of different neck widths. The engaging portion 42 couples with the neck 44 using a snap-fit mechanism (an example is shown in detail in Figure 6). In the example shown in Figure 6, the snap-fit mechanism 100 is a one-use sort of mechanism. The snap-fit mechanism 100 has a plurality of flexible limbs 102 which converge towards a central axis 104. When a cap 45 of the vial 46 moves along the central axis 104 and passes through an opening 106 defined by the limbs 102, the limbs 102 allow the cap 45 to pass through the opening 106 but snaps onto the neck 44 in a manner which does not allow removal of the vial 46. Removal of the vial 46 is only possible if several of the limbs 102 are broken. Thus, it is appreciated that the vial 46 is irreversibly coupled to the safety cap 40 unless the safety cap 40 is damaged. In this regard, the vial safety cap 40 can be a single-use item which can be disposed together with the coupled vial 46.

Referring to Figure 4, there is shown a perspective view of the vial safety cap 40 when in use. The vial 46 is shown to be coupled with the engaging portion 42 of the vial safety cap 40.

The vial safety cap 40 also includes a channel 48 defined by a receptor portion 49 located at a pre-determined distance from the engaging portion 42. The channel 48 is configured for allowing passage of a barrel 51 of a syringe 50, the syringe 50 being of the insulin syringe configuration. The channel 48 has a circular cross-section and the pre-determined distance is at least a length of a needle of the insulin syringe 50. It should be noted that syringes which are bigger than the largest insulin syringe configuration are not usable with the vial safety cap 40 because of the channel 48. The pre-determined distance is necessary to enable sufficient surface area for gripping by the user.

The pre-determined distance also ensures that an enclosure 47 is provided within the vial safety cap 40 to allow removal of a seal from a cap of the vial 46. Furthermore the enclosure 47 also allows the cleaning of the cap of the vial 26 to avoid contamination of the cap of the vial 46. This ensures that a part of the vial 46 remains covered by the seal prior to use. It should be noted that the receptor portion 49 ensures a needle of the syringe 50 is able to enter the vial 46 when the syringe 50 is located within the channel 48. A length of the channel 48 combined with the pre-determined distance should be longer than a needle of a regular syringe 300. This ensures that regular syringes 300 are not able to draw insulin from the vial 26 when a barrel of regular syringes 300 does not fit within the channel 48.

Moreover, the enclosure 47 is also configured to surround a needle of the syringe 50 such that needle stick issues are prevented since the user's hand is protected by the vial safety cap 40.

Furthermore, the vial safety cap 40 also includes a holding portion 56 between the engaging portion 42 and the channel 48 which provides a greater surface area for gripping by the user for a more stable hold. In addition, the vial safety cap 40 is also shaped in a configuration to prevent rolling when the vial safety cap 40 is placed on a flat surface. This is convenient for users who engage the vial 46 to the vial safety cap 40 and subsequently leave the vial safety cap 40 on a flat surface like, for example, a table, a trolley, and so forth.

Referring to Figure 5, there is shown a third embodiment of a vial safety cap 60 for vials of insulin. The vial safety cap 60 is specifically configured for use with an insulin syringe. The vial safety cap 60 includes an engaging portion 62 configured for coupling with a vial, particularly a neck of the vial. When the engaging portion 62 can be varied, then the vial safety cap 60 can be coupled with vials of different neck widths. The vial is not shown in Figure 5, but the vials 26, 46 shown in relation to the other embodiments are similar to the vial used with the third embodiment. Figure 7 does show the vial safety cap 60 coupled to a vial. The engaging portion 62 couples with the neck using a snap-fit mechanism (an example is shown in detail in Figure 6). In the example shown in Figure 6, the snap-fit mechanism 100 is a one-use sort of mechanism. The snap-fit mechanism 100 has a plurality of flexible limbs 102 which converge towards a central axis 104. When a cap of the vial moves along the central axis 104 and passes through an opening 106 defined by the limbs 102, the limbs 102 allow the cap to pass through the opening 106 but snaps onto the neck in a manner which does not allow removal of the vial. Removal of the vial is only possible if several of the limbs 102 are broken. Thus, it is appreciated that the vial is irreversibly coupled to the safety cap 60 unless the safety cap 60 is

damaged. In this regard, the vial safety cap 60 can be a single-use item which can be disposed together with the coupled vial. It should be appreciated that other engaging mechanisms can be used, such as, for example, a friction fit mechanism, a magnetic mechanism, and so forth.

5 The vial safety cap 60 also includes a channel 68 defined by a receptor portion 69 located at a pre-determined distance from the engaging portion 62. The channel 68 is configured for allowing passage of a barrel of a syringe, the syringe 50 being of the insulin syringe configuration. It should be noted that syringes which are bigger than the largest insulin syringe configuration are not usable with the vial safety cap 60 because of the channel 68. The channel 68 has a U-shaped cross-section
10 and the pre-determined distance is at least a length of a needle of the insulin syringe. The pre-determined distance ensures that an enclosure 67 is provided within the vial safety cap 60 to allow removal of a seal from a cap of the vial. This ensures that a part of the vial remains covered by the seal prior to use. Furthermore the enclosure 67 also allows the cleaning of the cap of the vial 26 to avoid contamination of the cap of the vial. It should be noted that the receptor portion 69 ensures a
15 needle of the syringe is able to enter the vial when the syringe is located within the channel 68 via the receptor portion 69 of the vial safety cap 60. A length of the channel 68 combined with the pre-determined distance should be longer than a needle of a regular syringe 300. This ensures that regular syringes 300 are not able to draw insulin from the vial when a barrel of regular syringes 300 does not fit within the channel 68.

20 Moreover, the enclosure 67 is also configured to surround a needle of the syringe such that needle stick issues are prevented since the user's hand is protected by the vial safety cap 60.

Furthermore, the vial safety cap 60 also includes a holding portion 76 between the engaging portion
25 62 and the channel 68 which provides a greater surface area for gripping by the user for a more stable hold. In addition, the vial safety cap 60 is also shaped in a configuration to prevent rolling when the vial safety cap 60 is placed on a flat surface. This is convenient for users who engage the vial to the vial safety cap 60 and subsequently leave the vial safety cap 60 on a flat surface like, for example, a table, a trolley, and so forth.

30 Referring to Figure 7, there is shown a photograph of the vial safety cap 60 when in use. A vial 66 (with neck 64) and an insulin syringe 70 (with barrel 71) are also shown. The requisite labels as per the preceding description for the third embodiment are incorporated into Figure 7 so as to provide clarity when describing the third embodiment.

It should be appreciated that the various embodiments of the vial safety cap 20, 40, 60 all provide the following benefits:

- 5 - ensuring that only insulin syringes or smaller are usable with the vials of insulin;
- preventing the use of wrong syringes;
- ensuring that the sterility of the part of the vial which comes into contact with a needle of the syringe is maintained as the part can be cleaned;
- protection of the user from needle stick issues when drawing medication from the vials;
- 10 - better grip for the user when drawing insulin into the syringe; and
- ensuring that the vial does not roll off a flat surface when the vial is coupled to the vial safety cap.

Finally, even though the description of the various embodiments for the vial safety cap 20, 40, 60 relate to use with insulin syringes, it should be appreciated that the vial safety cap 20, 40, 60 can be
15 adapted to use with other forms of specialized syringes which are smaller than regular syringes.

Reference is now made to Figure 9 which shows a vial 400 integrated with a safety cap 402 similar to the second embodiment 40 described earlier, except that the safety cap 402 does not include an engagement portion as the safety cap 402 is moulded together with the vial 400. It should be noted
20 that the vial 400 and the safety cap 402 can be manufactured using, for example, moulding, assembling of parts, and the like. Furthermore, the vial 400 and the safety cap 402 need not be made of the same material. It should also be noted that the vial 400 is a single-use item.

The vial 400 includes a channel 480 defined by a receptor portion 490 located at a pre-determined
25 distance from a cap of the containment portion 404 of the vial 400. The channel 480 is configured for allowing passage of a barrel of a syringe, the syringe being of the insulin syringe configuration. The channel 480 has a circular cross-section and the pre-determined distance is at least a length of a needle of the insulin syringe 50. It should be noted that syringes which are bigger than the largest insulin syringe configuration are not usable with the vial 400 because of the channel 480. The pre-
30 determined distance is necessary to enable sufficient surface area for gripping by the user. The pre-determined distance also ensures that an enclosure 470 is provided to allow removal of a seal from a cap of the containment portion 404. Furthermore the enclosure 470 also allows the cleaning of the cap of the containment portion 404 to avoid contamination of the cap of the containment portion 404. This ensures that the cap of the containment portion 404 remains covered by the seal prior to

use. It should be noted that the receptor portion 490 ensures a needle of the syringe is able to enter the containment portion 404 when the syringe is located within the channel 480. A length of the channel 480 combined with the pre-determined distance should be longer than a needle of a regular syringe 300. This ensures that regular syringes 300 are not able to draw insulin from the containment portion 404 when a barrel of regular syringes 300 does not fit within the channel 480.

Moreover, the enclosure 470 is also configured to surround a needle of the syringe such that needle stick issues are prevented since the user's hand is protected by the safety cap 402.

Furthermore, the vial safety cap 402 also includes a holding portion 560 which provides a greater surface area for gripping by the user for a more stable hold. In addition, the vial 400 is also shaped in a configuration to prevent rolling when the vial 400 is placed on a flat surface. This is convenient for users who leave the vial 400 on a flat surface like, for example, a table, a trolley, and so forth.

It is appreciated that the vial 400 offers identical advantages as the vial safety cap 20, 40, 60 described in the preceding paragraphs.

Whilst there have been described in the foregoing description preferred embodiments of the present invention, it will be understood by those skilled in the technology concerned that many variations or modifications in details of design or construction may be made without departing from the present invention.

CLAIMS

1. A vial safety cap specifically configured for use with a specialised syringe, the safety cap including:
 - 5 an engaging portion configured for coupling with a vial; and
 - a receptor portion including a channel located at a pre-determined distance from the engaging portion, the channel being configured for allowing passage of a barrel of the syringe, wherein the receptor portion enables a needle of the syringe to pierce a cap of the vial.
- 10 2. The safety cap of claim 1, wherein the channel has a cross section selected from shapes selected from: U-shaped, V-shaped and circular.
3. The safety cap of either claim 1 or 2, wherein the engaging portion couples with the neck using a mechanism selected from a group consisting of: a friction fit mechanism, a snap-fit
15 mechanism and a magnetic mechanism.
4. The safety cap of any one of claims 1 to 3, wherein the pre-determined distance is at least a length of the needle of the syringe.
- 20 5. The safety cap of any one of claims 1 to 4, wherein the pre-determined distance ensures that an enclosure is provided within the safety cap.
6. The safety cap of claim 5, wherein the enclosure is configured to surround the needle of the syringe.
25
7. The safety cap of claim 5, wherein the enclosure allows the cap of the vial to be cleaned prior to being pierced by the syringe.
8. The safety cap of any one of claims 1 to 7, further including a holding portion between the
30 engaging portion and the channel.
9. The safety cap of any one of claims 1 to 8 being shaped in a configuration to prevent rolling on a flat surface.

10. The safety cap of any one of claims 1 to 9, wherein a length of the channel combined with the pre-determined distance is longer than a needle of a regular syringe.

11. In combination, the safety cap of any one of claims 1 to 10 when used with a vial.

5

12. A vial specifically configured for use with a specialised syringe, the vial including:
a containment portion; and

a receptor portion including a channel located at a pre-determined distance from the containment portion, the channel being configured for allowing passage of a barrel of the syringe,
10 wherein the receptor portion enables a needle of the syringe to pierce a cap of the containment portion.

13. The vial of claim 12, wherein the pre-determined distance is at least a length of a needle of the syringe.

15

14. The vial of any one of claims 12 to 13, wherein the pre-determined distance ensures that an enclosure is provided within the vial.

15. The vial of claim 14, wherein the enclosure is configured to surround the needle of the syringe.

20

16. The vial of claim 14, wherein the enclosure allows the cap of the containment portion to be cleaned prior to being pierced by the syringe.

17. The vial of any one of claims 12 to 16, further including a holding portion between the containment portion and the channel.

25

18. The vial of any one of claims 12 to 17 being shaped in a configuration to prevent rolling on a flat surface.

30

19. The vial of any one of claims 12 to 18, wherein a length of the channel combined with the pre-determined distance is longer than a needle of a regular syringe.