

VASCULAR ACCESS DEVICE ADAPTER

TECHNICAL FIELD

[0001] The present disclosure generally relates to devices, assemblies, and systems adapted for use with vascular access devices, and more particularly, a vascular access device adapter allowing for interchangeable connections between components of a larger extravascular system while minimizing exposure to non-sterile environments during point-of-care testing and analysis.

BACKGROUND

[0002] Vascular access devices (VADs) are commonly used therapeutic devices in extravascular systems, which include intravenous (IV) catheters, winged needle sets (WNS), syringes, tubing, high pressure extension tubing, sample container collection devices, blood sample containers and needleless access devices. Such devices may be commonly connected directly to one another with corresponding fittings such as luer locks or luer slips, and may be interchangeably fitted with other devices to facilitate other medical treatments.

[0003] By way of example, a clinician may first attach a sample container collection device to a WPN for blood sampling and subsequently flush the WPN using a conventional saline flush syringe. Both the sample container collection device and the conventional flush syringe may have a male fitting while the WPN may have a corresponding female fitting. Similarly, a clinician may first attach a syringe to a needle to extract medication from a vial and subsequently administer the medication intravenously using the same needle. A clinician may alternatively attach the syringe to a catheter to administer the medication. The syringe may have a male fitting while both the needle and the catheter may have a corresponding female fitting.

[0004] Such devices may often be disposable and are usually stored in sterile packaging. However, between interchanging of medical devices both the male and female fittings are exposed to a non-sterile environment. Furthermore, blood leak may occur both during interchanging of medical devices and in sequential filling of multiple blood sample containers.

[0005] Current practices attempt to limit infections and exposure to nonsterile environments with proper technique such as disinfecting fittings between uses and further saline flushes. There exists a need for a universal disposable device allowing for

interchangeable connections between components of a larger extravascular system while minimizing exposure to non-sterile environments.

SUMMARY

5 [0006] In view of the above-described shortcomings within the prior art, a vascular access device adapter allowing for interchangeable connections between separate components of a larger extravascular system while minimizing exposure to non-sterile environments during point-of-care testing and analysis is provided herein. Further details and advantages of the present disclosure will be understood from the following detailed description read in
10 conjunction with the accompanying drawings.

[0007] In accordance with one or more embodiment of the present disclosure, a vascular access device adapter is disclosed that includes an end cap at least partially inserted over a cylindrical housing body and a self-healing puncturable septum disposed between the end cap and housing body, creating a seal. A fitting integrally formed to the proximal end of
15 the housing body connects the vascular access device to a separate device having a corresponding fitting. By way of example, the fitting may be a threaded connection, a luer lock, a luer slip, a needleless entry, or a common medical connection.

[0008] In accordance with one or more embodiment of the present disclosure,,the septum is compressed against the distal end of the housing body and a bottom wall of the end
20 cap. Puncturing the septum through an aperture of the end cap with a hollow small gauge needle allows for fluid to flow from the needle to a separate device through the vascular access device. In accordance with one or more embodiment of the present disclosure, a flush syringe may be removably connected to the vascular access device adapter and the kit may be used to flush a winged needle set by puncturing the septum with a hollow gauge needle of the winged
25 needle set during a blood draw sampling.

[0009] In accordance with one or more embodiment of the present disclosure, the end cap may be secured with an interference fit over an outer wall of the housing body. In one or more embodiments, the end cap may be secured with a medical grade adhesive or a threaded connection. The end cap may further include ribs disposed on the outer sidewall which
30 removably secure the device adapter to the inner housing of a sample collection device such as a VACUTAINER® by an interference fit.

In accordance with one or more embodiment of the present disclosure,, the septum may be integrally formed to the housing body without the need for an end cap. In further configurations, the distal portion of the housing body may be configured for needless connections or blunt tip cannulas, allowing for a needless connection. Such a configuration
5 may include split septums or valve locks, allowing for compatibility with systems such as BD Q-SYTE® Luer Access Split Septum systems, BD INTERLINK® systems and BD SMARTSITE® systems, commercially available from Becton, Dickinson, and Company. Configurations without an end cap may be accompanied by a retainer clip accessory by which the vascular access adapter may be removably inserted and secured to the inner housing of a
10 sample collection device such as a VACUTAINER®, also commercially available from Becton, Dickinson, and Company.

BRIEF DESCRIPTION OF THE DRAWINGS

- [0010] FIG 1. illustrates a side view of a vascular access device adapter as part of a larger extravascular system in accordance with a first embodiment of the present disclosure;
- 15 [0011] FIG. 2 illustrates a detailed perspective view of the vascular access device adapter in accordance with the first embodiment of the present disclosure;
- [0012] FIG. 3 illustrates an exploded perspective view of the vascular access device adapter in accordance with the first embodiment of the present disclosure;
- [0013] FIG 4A illustrates a perspective view of a sample container collection device as
20 part of the larger extravascular system of the first embodiment;
- [0014] FIG 4B illustrates a cross sectional view of a sample container collection device as part of the larger extravascular system of the first embodiment;
- [0015] FIG. 4C illustrates a perspective view of the vascular access device adapter disposed within the container collection device as part of the larger extravascular system;
- 25 [0016] FIG. 5 illustrates a side view of a vascular access device adapter as part of a larger extravascular system in accordance with a second embodiment of the present disclosure;
- [0017] FIG. 6 illustrates a side view of the vascular access device adapter in accordance with the second embodiment of the present disclosure;
- [0018] FIG. 7 illustrates a side view of a female-to-female adapter in accordance with a
30 second embodiment of the present disclosure.

- [0019] FIG 8A illustrates a side cross sectional view of a sample container collection device as part of the larger extravascular system of the second embodiment;
- [0020] FIG 8B illustrates a perspective view of a retainer clip as part of the larger extravascular system of the second embodiment;
- 5 [0021] FIG 9 illustrates a side view of the vascular access device adapter in accordance with a third embodiment of the present disclosure;
- [0022] FIGS 10 illustrates side views of a vascular access device adapter in accordance with a fourth embodiment of the present disclosure; and
- [0023] FIG. 11 illustrates a extravascular system kit in accordance with one or more
10 embodiments of the present disclosure.
- [0024] FIGS 12A and 12B illustrate a method of use of the vascular access device adapter in accordance with one or more embodiments of the present disclosure.

DETAILED DESCRIPTION

- [0025] Before describing several exemplary embodiments of the disclosure, it is to be
15 understood that the disclosure is not limited to the details of construction or process steps set forth in the following description. The disclosure is capable of other embodiments and of being practiced or being carried out in various ways.
- [0026] For purposes of the description hereinafter, the terms “upper”, “lower”, “right”, “left”, “vertical”, “horizontal”, “top”, “bottom”, “lateral”, “longitudinal”, and derivatives
20 thereof shall relate to the disclosure as it is oriented in the drawing figures. However, it is to be understood that the disclosure may assume alternative variations and step sequences, except where expressly specified to the contrary. It is also to be understood that the specific devices and processes illustrated in the attached drawings, and described in the following specification, are simply exemplary embodiments of the disclosure. Hence, specific dimensions and other
25 physical characteristics related to the embodiments disclosed herein are not to be considered as limiting.
- [0027] The present disclosure relates to a vascular access device adapter **110**, allowing for interchangeable connections between components of an exemplary larger extravascular system while minimizing exposure to non-sterile environments during point-of-care testing and
30 analysis. An exemplary extravascular system **10** kit is depicted in FIG 1. In one or more embodiments, the system includes an exemplary pre-filled flush syringe **16**, the vascular access

device adapter **110**, an exemplary winged needle set **12** and a sample collection tube (not shown), such as a BD VACUTAINER® blood collection tube, commercially available from Becton, Dickinson, and Company. The vascular access device adapter **110** includes a proximal adapter fitting **166** configured to receive additional components of the extravascular system **10**.

5 By way of example, in one or more embodiments, the proximal adapter fitting **166** may include a set of threads for coupling the flush syringe **16** to the vascular access device adapter **110**.

[0028] As shown in FIG. 2, in the present embodiment, the flush syringe includes a female luer fitting **16a** connected to the proximal adapter fitting **166** of the vascular access device adapter **110**. As shown, the proximal adapter fitting **116** is a male luer fitting, the male and female luer fittings adapted to correspond to one another, allowing fluid communication between the vascular access device adapter **110** and connections between additional components of the extravascular system **10**.

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[0029] Referring back to FIG. 1, the exemplary winged needle set **12** may include a blood draw catheter **62**, integrated extension tubing **64**, a needle hub **66**, a hollow small gauge needle (not shown) and a protective elastomeric sleeve (not shown). The integrated extension tubing **64** connecting the blood draw catheter **62** and the needle hub **66**. In one or more embodiments, the needle hub **66** housing the hollow small gauge needle **68** with the elastomeric sleeve **70** are integrally joined to the needle hub **66**, at least partially covering the hollow small gauge needle **68**. A tapered or pointed end of the hollow small gauge needle **68** being configured to puncture a rubber stopper or septum of a vascular access device adapter of one or more embodiments disclosed herein.

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[0030] During a blood draw, a practitioner may first insert the small gauge needle **68** into the sample collection tube (not shown), piercing a septum (not shown) of the sample collection tube. After extracting a blood sample, a saline flush may be performed by inserting the small gauge needle **68** into a septum **130** of the vascular access device adapter **110**. Thus, the vascular access device adapter **110** minimizes additional steps of connecting and disconnecting additional devices and adapters, minimizing the risks of blood exposure and infection. The septum or stopper of the sample collection tube and the vascular access device adapter **110** is self-healing and self-healing when a needle is removed from the septum or stopper.

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[0031] Separate, additional components of the extravascular system **10** may further include needles, saline flush syringes, conventional syringes, needleless access systems, IV

catheters, sample container collection devices and blood sample containers. Such devices may have generally standardized couplings, ports or fittings. Said components are interchangeable with components of embodiments described herein.

[0032] With reference to FIGS. 2 and 3, the vascular access device adapter **110** is described in greater detail. The vascular access device adapter **110** comprises a substantially cylindrical housing body **112**, a self-healing puncturable septum **130** and an end cap **140**. The septum **130** is disposed within the end cap **140**, abutting a distal housing end **116** of the housing body **112**. The distal housing end **116** is at least partially inserted in the adapter end cap **140**, compressing the septum **130** between the distal housing end **116** and an end cap bottom wall **150** of the end cap **140**, creating a seal.

[0033] The structure of the cylindrical housing body **112** includes a proximal end **114**, a distal end **116**, an outer housing sidewall **120** and an aperture defining an interior flow channel **176**. The housing body **112** and interior flow channel **176** extending concentrically along an axis **124**. Projecting proximally from the proximal end **114** is the previously defined proximal adapter fitting **166**.

[0034] While the fitting **166** of the vascular access device adapter **110** in FIGS. 2-3 is a male luer fitting for connecting to the female luer connector of a flush syringe, the fitting **166** may alternatively include a male luer fitting. In the preferred embodiment, the proximal adapter fitting **116** is a threaded, male luer connector, however in alternative embodiments the proximal adapter fitting **116** can be configured as a threaded female luer connector, a female luer slip connector, a male luer slip connector or other connectors known in the art. Said connectors are configured to removably or non-removably mate with components of the extravascular system **10**.

[0035] Where the particular proximal adapter fitting **166** of the vascular access device adapter **110** is incompatible with a component of the extravascular system **10**, an additional female-to-female or female-to-female luer adapter (not shown) may be used to couple the otherwise incompatible devices. Further adapters may include, by way of example, luer-lock-to-luer-slip adapters, luer-lock-to-threaded-connection adapters or any combination thereof. For example, an embodiment of the vascular access device adapter having a male luer lock may be connected to a flush syringe also having a male luer lock with a female-to-female luer adapter **19** as shown in FIG. 7.

[0036] Exemplary configurations for couplers, fittings, ports and adapters may include commercially available luer locks, luer slip ports, locking ports, threaded connections, interlocking connection or generally other common medical device fitting known in the art. Further embodiments of the vascular access device **110** adapter may be adapted to utilize such
5 couplers, fittings and ports.

[0037] As shown in FIG. 3, the proximal adapter fitting **166** further includes a concentric lumen (not shown) extending therethrough along the axis **124**. The flow channel **176** and the concentric lumen **178** being in fluid communication with one another.

[0038] The structure of the adapter end cap **140** includes a generally cylindrical end
10 cap body **142** having an inner sidewall (not shown), an outer cap sidewall **154**, a distal cap end **148**, and a substantially open proximal cap end **146**. The open proximal cap end **146** defining an interior cavity extending to a bottom wall **150**, the bottom wall **150** being disposed at the distal cap end **148**. The bottom wall **150** having a concentric aperture **152** extending therethrough along an axis **125**.

[0039] In one or more embodiments, a plurality of ribs **156** are disposed radially
15 around the outer cap sidewall **154**, the ribs **156** extending at least partially the length of the outer cap sidewall **154**. The plurality of ribs **156** are configured to provide a tactile gripping surface for twisting the vascular access device adapter **110**. The plurality of ribs **156** are also configured to create removable a friction fit with a barrel of a sample container collection
20 device **14** as explained in further detail below. The friction fit is configured to securely retain the vascular access device adapter **110** within the barrel of the vascular access device adapter **110** during blood draw, thus not requiring a practitioner to manually hold the vascular access device adapter **110** in place.

[0040] In one or more embodiments, the adapter end cap **140** further includes a venting
25 feature by which a clinician may prime the coupled flush syringe **16** and vascular access device adapter **110** during a saline flush. Priming is intended to vent and remove any air from an otherwise closed system or to prevent air entering a patient's blood stream during a saline flush.

[0041] Referring to FIG. 3, the septum **130** in the present embodiment has a flange
30 shape comprising a generally cylindrical proximal portion **134** and a generally cylindrical distal portion **136**. The proximal portion **134** having a smaller diameter than the diameter of the cylindrical distal portion **136**. The transition from the proximal portion **134** to the distal portion

136 defining a ridge 132. Other embodiments of the septum may include a generally cylindrical body having a substantially trapezoidal, triangular or tapered cross-section. The material of the septum 130 may generally be an elastic polymer or rubber, creating a barrier which allows for the repeated piercing of conventional needles and the transfer of fluid through the barrier without leakage.

5 [0042] The vascular access device adapter 110 is assembled by pressing the cylindrical housing body 112 at least partially through the open proximal cap end 146, thereby causing compression of the septum 130 against the bottom wall 150 of the end cap 140. Fully assembled, the ridge 132 abuts the distal end 116 of the cylindrical housing body 112 creating
10 a fluid-tight seal. The cylindrical housing body 112 is joined with the end cap 140 by an interference press-fit between the outer housing sidewall 120 of the cylindrical housing body 112 and the inner sidewall (not shown) of the end cap 140. In one or more embodiments, the outer housing sidewall 120 of cylindrical housing body 112 is joined with the inner sidewall (not shown) of end cap 140 using a threaded connection, a locking mechanism or medical
15 grade adhesive, sonic welding or a combination thereof.

[0043] Fully assembled, the aperture 152 of the end cap 140 is sufficiently large enough to allow for a conventional needle or, in the present embodiment, the hollow small gauge needle 68 to pierce through the septum 130. Saline fluid may then flow from the greater flow channel 180 through the small gauge needle 68, flushing the winged needle set 12.

20 [0044] As previously described, the proximal adapter fitting 166 of the vascular access device adapter 110 is configured to receive additional components of the extravascular system 10, including conventional syringes, the syringe 16 or the exemplary flush syringe 14. Further, the self-healing septum 130 of the access device adapter 110 is configured to receive needles whereby fluid communication is established between the vascular access device adapter 110
25 and the lumen of the needle being inserted. One such configuration is describe below, in which a connector of the syringe 16 is connected to the proximal adapter fitting 166 of the access device adapter 110 and the vascular access device adapter 110 is inserted into a barrel of the sample container collection device 14.

[0045] With reference to FIGS. 4A-4C, the sample container collection
30 device 14 includes a generally cylindrical body 40 having an inner sidewall 42, a substantially open first end 44, and second end 48, the substantially open end 44 defines an interior cavity. The second end 48 includes a bottom wall 50 from which a concentric placed fastener 52

extends in a distal direction. The fastener **52** fastens the sample container collection device **14** to blood sample extraction devices such as, but not limited to, catheters or winged needle sets of the extravascular system **10** having corresponding adapters. In the depicted embodiment of FIGS 4A-4C, the fastener **52** is a female luer lock corresponding to fasteners of blood sample extraction devices of the extravascular system **10**.

5 [0046] Exemplary configurations for couplers, fittings, ports and adapters may include commercially available luer locks, luer slip ports, locking ports, threaded connections, interlocking connection or generally other common medical device fitting known in the art. Further embodiments of the fastener **52** may be adapted to utilize such couplers, fittings and
10 ports.

[0047] The fastener **52** has a concentric aperture defining a fastener channel (not shown) extending through the bottom wall **50**. The bottom wall includes a concentrically placed integrated hollow small gauge needle **54**, the small hollow gauge needle **54** having a lumen defining a needle channel **60**. The fastener channel **58** and the needle channel **60** being
15 in fluid communication with one another.

[0048] In one or more embodiments, the sample container collection device **14** further includes a protective elastomeric sleeve **46** substantially covering the hollow small gauge needle **54**. The protective elastomeric sleeve **46** is configured to collapse on itself upon advancement of the vascular access device adapter **110**. In one or more embodiments, the
20 elastomeric sleeve **46** is integrally joined to the bottom wall **50**. The protective elastomeric sleeve **46** is configured to protect the hollow small gauge needle **54** when not in use. In some embodiments, the protective elastomeric sleeve **46** is also configured to provide a sterile barrier from atmosphere.

[0049] As shown in FIG. 4C, following insertion of the vascular access device adapter
25 **110** inside the cylindrical body **40**, the protective elastomeric sleeve **46** is compressed, which at least partially exposes the small gauge hollow needle **54**. Upon insertion, the small gauge hollow needle **54** punctures the septum **130**. The previously described ribs **156** counteract the restorative force of the sleeve **46**, holding the device adapter **110** in place within the cylindrical body **40** by the interference fit created between the ribs **156** and the inner wall of the
30 cylindrical body **40**. The user is then able to freely manipulate the syringe **16** which the device adapter **110** is attached to without having to simultaneously hold the device in place.

[0050] In one or more embodiments, the vascular access device adapter **110** may also be utilized without a sample collection device **14**. Any insertion device which also has a pointed hollow gauge needle may directly pierce the septum **130**. By way of example, the winged needle set **12** may be utilized, whereby the hollow small gauge needle **68** may pierce the septum **130**.

[0051] In one or more embodiments, the components of the vascular access device adapter **110**, excluding the septum **130**, may be made from a rigid polymeric material selected from one or more of a polyester, co-polyester, polycarbonate, polyethylene, polystyrene or polypropylene. In one or more embodiments, the septum **130** may be made from a soft, flexible polymeric material selected from one or more of a thermoplastic elastomer (TPE), thermoplastic polyurethane (TPU), thermoplastic vulcanizate elastomer (TPV), olefin block copolymers (OBC), polyisoprene, silicone or rubber.

[0052] Referring now to FIGS. 5-8B, an exemplary extravascular system of a second embodiment is depicted. The system includes a vascular access device adapter **210** in accordance with a second embodiment, a female-to-female adapter **19** and the syringe **16** as previously described. The system may further include elements from the first embodiment, including the sample container collection device **14** and the winged needle set **12**.

[0053] As previously described, while the exemplary extravascular system of a second embodiment includes the female-to-female adapter **19**, where further embodiments comprise a male and a female connector, said female-to-female adapter **19** is not required and the syringe **16** may be directly connected to the vascular access device adapter **210**.

[0054] As shown in FIG. 6, the vascular access device adapter **210** comprises a substantially cylindrical housing body **212** and a self-healing puncturable septum **230**. The septum **230** is integrally joined onto a distal housing end **216** of the housing body **212**, creating a fluid seal. The material of the septum **230** may generally be an elastic polymer or rubber, creating a barrier which allows for the repeated piercing of conventional needles and the transfer of fluid through the barrier.

[0055] The structure of the cylindrical housing body **212** includes a proximal end **214**, the distal end **216**, an outer housing sidewall **220** and an aperture defining an interior flow channel (not shown). The housing body **212** and interior flow channel (not shown) extend concentrically along an axis **224**. Projecting proximally from the proximal end **214** is a proximal adapter fitting **266**. The proximal adapter fitting **266** further includes a concentric

lumen (not shown) extending therethrough along the axis **224**. The flow channel **276** and the concentric lumen **278** are in fluid communication.

[0056] Exemplary configurations for couplers, fittings, ports and adapters may include commercially available luer locks, luer slip ports, locking ports, threaded connections, interlocking connection or generally other common medical device fitting known in the art. Further embodiments of the proximal adapter fitting **266** may be adapted to utilize such couplers, fittings and ports.

[0057] In one or more embodiments, the cylindrical housing body **212** may further include a venting feature by which a clinician may prime the coupled flush syringe **16** and vascular access device adapter **210** during a saline flush as described. Priming is intended to vent and remove any air from an otherwise closed system or to prevent air entering a patient's blood stream during a saline flush.

[0058] In one or more embodiments, the cylindrical housing body **212** of the vascular access device adapter **210** may further include a ridge **256**, disposed radially around the outer sidewall **220**. The ridge **256** is configured to aid in manipulation of the vascular access device adapter **210** and, specifically, the surface of the ridge **256** is aids in twisting, threading, pulling or pushing the vascular access device adapter **210**.

[0059] In one or more embodiments, the ridge **256** extends outward from the cylindrical housing body **212** and is configured to interlock lock onto a jaw set **310** of a retainer clip **300** described in further detail below.

[0060] As shown in FIGS. 6 and 7, the female-to-female adapter **19** is configured to couple a distally located female connector **17** of the flush syringe **16** to the proximal adapter fitting **266** of the vascular access device adapter **210** where connection is otherwise not possible due to incompatibility of the distally located female connector **17** of the flush syringe **16** and the proximal adapter fitting **266** of the vascular access device adapter **210**. The female-to-female adapter **19** comprises a substantially cylindrical body **80** having a proximal portion, a medial portion and a distal portion. The proximal portion has a proximal male connector **82** configured to connect to the distally located female connector **17** of the flush syringe **16** and the distal portion has a distal male connector **84** configured to connect to the proximal adapter fitting **266** of the vascular access device adapter **210**. In one or more embodiments, the medial portion has a radial protrusion **86** extending from the cylindrical body **80**. In one or more embodiments, the radial protrusion **86** further includes a plurality of

longitudinal ribs **86**. The radial protrusion **86** and the plurality of longitudinal ribs **86** are configured to aid in manipulation of the female-to-female adapter **19**. By way of example, the plurality of longitudinal ribs **86** aid in application of a rotational or torsional force to uncouple threaded or twist-lock connections. In one or more embodiments, the radial protrusion **86** may further be in the shape of a trapezoid or a winged protrusion. The shape aids in pushing or pulling the female-to-female adapter **19** against components.

[0061] In the depicted female-to-female adapter **19**, the proximal male connector **82** further includes at least one proximal thread **83** and the distal male connector **84** further includes at least one distal thread **85**. The least one proximal thread **83** and the distal thread **85** are configured to threadedly couple with female connectors.

[0062] As previously described, the ridge **256** of the vascular access device adapter **210** extends outward from the cylindrical housing body **212** and is configured to interlock onto a jaw set **310** of a retainer clip **300**.

[0063] As shown in FIGS. 8A and 8B, the retainer clip **300** includes a substantially cylindrical clip body **302**, an aperture **301** extending therethrough and the jaw set **310** disposed on a proximal end **306**. The jaw set **310** is oriented towards the center of the cylindrical clip body **302**. The retainer clip **300** may be inserted into the cylindrical body **40** of the sample container collection device **14** creating an interference fit. The vascular access device adapter **210** attached to the syringe **16** may then be inserted, the jaw set **310** locking the vascular access device adapter **210** and the retainer clip **300**, counteracting the restorative force of the sleeve **46**, holding the device adapter **210** in place within the cylindrical body **40** by the interference fit created between the cylindrical clip body **302** and the inner wall of the cylindrical body **40**. The user is then able to freely manipulate the separate device which the device adapter **210** is attached to without having to simultaneously hold the device in place. Removal of the vascular access device adapter **210** in the present embodiment also removes the retainer clip **300**; however in alternative embodiments the jaws set **310** may have sufficient elastic deformation to allow removal of the vascular access device adapter **210** without removing the retainer clip **300**. Alternate embodiments of the retainer clip **300** may not have jaws. The locking may be achieved by an interference fit, a locking mechanism or a set of threads.

[0064] FIG. 9 depicts the vascular access device adapter **210** having the proximal adapter fitting **266** directly connected to a male fitting **92** of an exemplary conventional syringe

90. Where the proximal adapter fitting **266** and the male fitting **92** are compatible, the female-to-female adapter **19** is not required.

[0065] FIG. 10 illustrates yet another embodiment of a vascular access adapter **310** connected to the female-to-female adapter **19** of one of the embodiments described herein. The vascular access device adapter **310** comprises a substantially cylindrical housing body **312** and a self-healing puncturable septum **330**. The septum **330** is integrally joined and substantially covers a distal housing end **316** of the housing body **312**, creating a fluid seal. The material of the septum **330** may generally be an elastic polymer or rubber, creating a barrier which allows for the repeated piercing of conventional needles and the transfer of fluid through the barrier.

5 [0066] The structure of the cylindrical housing body **312** includes a proximal end **314**, the distal end **316**, an outer housing sidewall **320** and an aperture defining an interior flow channel (not shown). The housing body **312** and interior flow channel (not shown) extend concentrically. Projecting proximally from the proximal end **314** is a proximal adapter fitting **366**. The proximal adapter fitting **366** further includes a concentric lumen (not shown) extending therethrough. In the depicted embodiment, the proximal adapter fitting **366** includes a plurality of threads **367** configured to mate with the at least one distal thread **85** of the female-to-female adapter **19**.

[0067] Exemplary configurations for couplers, fittings, ports and adapters may include commercially available luer locks, luer slip ports, locking ports, threaded connections, interlocking connection or generally other common medical device fitting known in the art. Further embodiments of the proximal adapter fitting **366** may be adapted to utilize such couplers, fittings and ports.

[0068] In one or more embodiments, the cylindrical housing body **312** may further include a venting feature by which a clinician may prime the coupled flush syringe and vascular access device adapter **310** during a saline flush as described. Priming is intended to vent and remove any air from an otherwise closed system or to prevent air entering a patient's blood stream during a saline flush.

[0069] In one or more embodiments, a plurality of ribs **368** extends from the proximal end **314** partially along the housing body **312**. The plurality of ribs **368** are configured to aid in manipulation of the vascular access device adapter **310**, and more specifically gripping and twisting or threading the vascular access device adapter **310**.

[0070] Figure 11 depicts the extravascular system **10** kit in which components described in the embodiments herein may be packed together in sterile blister packaging. In the depicted embodiment, the vascular access device adapter **210** is connected to the female-to-female adapter **19**. In one or more embodiments, the proximal end **83** of the female-to-female adapter **19** is covered with a disposable cap **98**. The disposable cap **98** is configured to maintain a sterile environment for the otherwise exposed proximal end **83** of the female-to-female adapter **19**. Likewise, a second disposable cap **99** may cover a provided flush syringe **16** of one or more embodiments described herein.

[0071] As shown in FIGS. 12A and 12B, a method of flushing a winged needle set **12** is described herein. The method comprises inserting the blood draw catheter **62** of embodiments described herein into the skin of a patient. The method further comprises inserting the hollow small gauge needle (not shown) of the winged needle set **12** into a septum (not shown) of a blood sample container **97** and withdrawing a blood sample. The method further comprises removing the blood sample container **97** and inserting the small gauge needle (not shown) of the winged needle set **12** into the septum (not shown) of the vascular access device adapter **110** of one or more embodiments described herein. The proximal adapter fitting **166** proximal adapter fitting **166** of the vascular access device adapter **110** is connected to the syringe **16**, and the method further includes flushing the integrated extension tubing **64** of the winged needle set **12**. The method further comprises removing the hollow small gauge needle (not shown) from the proximal adapter fitting **166** and sealing or clamping the winged needle set **12**. In one or more embodiments, the method further comprises removing the winged needle set **12** from the insertion site on the patient's skin.

[0072] In further embodiments, the distal end of a vascular access device adapter may be configured to be compatible with needless or blunt-tip connections such as a BD Q-SYTE® Luer Access Split Septum, also commercially available from Becton, Dickinson, and Company. In even further embodiments, the distal end of a vascular access device adapter may be configured to be compatible with needless or blunt-tip connections such as a BD INTERLINK® system, also commercially available from Becton, Dickinson, and Company. In even further embodiments, the distal end of a vascular access device adapter **610** may be configured to be compatible with needless or blunt-tip connections such as a BD SMARTSITE® system, also commercially available from Becton, Dickinson, and Company.

- [0073] Reference throughout this specification to “one embodiment,” “certain embodiments,” “various embodiments,” “one or more embodiments” or “an embodiment” means that a particular feature, structure, material, or characteristic described in connection with the embodiment is included in at least one embodiment of the disclosure. Thus, the appearances of the phrases such as “in one or more embodiments,” “in certain embodiments,” “in various embodiments,” “in one embodiment” or “in an embodiment” in various places throughout this specification are not necessarily referring to the same embodiment of the disclosure. Furthermore, the particular features, structures, materials, or characteristics may be combined in any suitable manner in one or more embodiments.
- 10 [0074] Although the disclosure herein provided a description with reference to particular embodiments, it is to be understood that these embodiments are merely illustrative of the principles and applications of the disclosure. It will be apparent to those skilled in the art that various modifications and variations can be made to the present disclosure without departing from the spirit and scope thereof. Thus, it is intended that the present disclosure
- 15 include modifications and variations that are within the scope of the appended claims and their equivalents.