CLAIMS

1. A delivery assembly, comprising:

a console including a vial containment region;

a vial engagement mechanism extending from the console within the vial containment region, wherein the engagement mechanism is configured to engage a vial assembly;

a sled assembly removably couplable to the console at the vial containment region; and

a safety shield removably couplable to the console over the vial containment region such that the vial engagement mechanism and the sled assembly are encapsulated within the safety shield when the safety shield is coupled thereto;

wherein the sled assembly, the vial assembly, and the safety shield are configured to inhibit radioactive emissions from within the vial containment region.

2. The delivery assembly of claim 1, wherein the vial assembly comprises:

a vial body formed of a material that inhibits radioactive emissions from within the vial body;

a locking feature coupled to the vial body and configured to securely engage the vial assembly to the sled assembly when the vial body is received therein; and

a plunger slidably translatable relative to the locking feature and through the vial body in response to the vial engagement mechanism engaging the vial assembly.

3. The delivery assembly of claim 2, wherein the plunger includes an engagement head having a pair of resilient arms that are sized and shaped to interlock with a pair of lever arms of the vial engagement mechanism.

4. The delivery assembly of claim 2, wherein the vial assembly comprises a septum disposed within a distal end of the vial body that is configured to seal the vial body.

5. The delivery assembly of any preceding claim, wherein the console comprises an interface display and one or more of a dosimeter, a linear encoder, an optical sensor, a linear displacement sensor, a flow sensor, an ultrasonic sensor, a magnetic encoder, a laser distance

sensor, an inductance sensor, a radial encoder, a volumetric sensor, a radiation sensor, and a mechanical transducer.

6. The delivery assembly of claim 5, wherein the interface display is communicatively coupled to one or more of the dosimeter, linear encoder, optical sensor, linear displacement sensor, flow sensor, ultrasonic sensor, magnetic encoder, laser distance sensor, inductance sensor, radial encoder, volumetric sensor, radiation sensor, and mechanical transducers.

7. The delivery assembly of any preceding claim, wherein the vial engagement mechanism is disposed within the vial containment region and proximate to the sled assembly when the sled assembly is coupled to the console.

8. The delivery assembly of claim 7, further comprising a delivery handle coupled to the vial engagement mechanism and configured to move the vial engagement mechanism within the vial containment region.

9. The delivery assembly of claim 8, wherein the delivery handle is configured to move the vial assembly relative to the sled assembly in response to actuating the delivery handle.

10. The delivery assembly of any preceding claim, wherein the sled assembly comprises a locking system and a vial chamber, wherein the locking system forms an aperture sized and shaped to receive the vial assembly therethrough and into the vial chamber.

11. The delivery assembly of claim 10, wherein the locking system comprises annular projections extending laterally into the aperture, wherein the annular projections are sized and shaped to engage a locking feature of the vial assembly when the vial assembly is received through the aperture and into the vial chamber.

12. The delivery assembly of claim 10, wherein the vial chamber is encapsulated in a protective shield that is formed of a material that inhibits radioactive emissions from within the vial chamber.

13. The delivery assembly of claim 10, wherein the sled assembly comprises a needle extending within the vial chamber, the needle being configured to puncture a septum of the vial assembly when the vial assembly is received within the vial chamber through the aperture.

14. The delivery assembly of claim 13, wherein sled assembly further comprises a manifold fluidically coupled to the needle such that the manifold is in fluidic communication with the vial chamber via the needle.

15. The delivery assembly of claim 14, wherein the sled assembly comprises one or more ports that are in fluid communication with the vial chamber through the manifold, wherein one or more delivery lines are operable to couple to the manifold via the one or more ports.

16. The delivery assembly of any preceding claim, wherein the sled assembly, the vial assembly, and the safety shield are formed of materials that inhibit radioactive emissions from within the vial containment region.

17. The delivery assembly of claim 2, wherein the plunger includes an engagement head having a bottom surface that is sized and shaped to interlock with a pair of lever arms of the vial engagement mechanism.

18. The delivery assembly of claim 17, wherein the vial assembly further includes a pair of flexible wings rotatably coupled to the plunger such that the pair of flexible wings are configured to flexibly deform in response to translation of the plunger outwardly from the vial body.

19. The delivery assembly of claim 18, wherein the pair of flexible wings are configured to form an engagement surface that is sized and shaped to interlock with the pair of lever arms in response to a deformation of the pair of flexible wings as the plunger translates outwardly from the vial body.

20. The delivery assembly of claim 2, wherein the plunger includes an upper engagement head and a lower engagement head positioned relatively beneath the upper engagement head along a longitudinal length of the plunger.

21. The delivery assembly of claim 20, wherein the upper engagement head includes a bottom surface that is sized and shaped to interlock with a pair of lever arms of the vial engagement mechanism in response to an upward translation of the vial engagement mechanism.

22. The delivery assembly of claim 21, wherein the lower engagement head includes a top surface that is sized and shaped to interlock with the pair of lever arms of the vial engagement mechanism in response to a downward translation of the vial engagement mechanism.

23. The delivery assembly of claim 22, wherein the plunger further includes at least a curved track and a linear track disposed along an exterior surface of the plunger, wherein the curved track and the linear track are sized and shaped to slidably receive a fixed pin of the vial body therein.

24. The delivery assembly of claim 23, wherein the curved track extends around the exterior surface of the plunger and the linear track extends along the exterior surface and parallel to a longitudinal length of the plunger.

25. The delivery assembly of claim 24, wherein the plunger is configured to rotate within and translate outwardly from the vial body in response to the pair of lever arms interlocking with the bottom surface of the upper engagement head when the vial engagement mechanism translates upward due to the fixed pin being received within the curved track.

26. The delivery assembly of claim 24, wherein the plunger is configured to translate into the vial body at a fixed orientation relative thereto in response to the pair of lever arms interlocking with the top surface of the lower engagement head when the vial engagement mechanism translates downward due to the fixed pin being received within the linear track.

27. The delivery assembly of any preceding claim, wherein the vial assembly comprises an inner chamber and a floating septum movably disposed therein.

28. The delivery assembly of claim 27, wherein the floating septum is configured to translate within the vial body in response to the inner chamber receiving fluid medium therein.

29. The delivery assembly of claim 28, wherein the floating septum engages a needle of the sled assembly positioned at a bottom end of the inner chamber as the floating septum translates within the vial body and the fluid medium within the inner chamber increases.

30. The delivery device of any preceding claim, wherein the vial engagement mechanism is coupled to an electrical system such that translation of the vial engagement mechanism within the vial containment region is electrically-driven.

31. The delivery device of any preceding claim, wherein the sled assembly includes a battery that is configured to supply power to the sled assembly and the console in response to the sled assembly coupling with the console at the vial containment region.

32. The delivery device of claim 31, wherein the sled assembly includes a battery status indicator communicatively coupled to the battery and configured to display data indicative of a charge of the battery.

33. The delivery device of any preceding claim, wherein the sled assembly is configured to maintain fluid leaks of therapeutic particles therein such that the sled assembly is operable to inhibit radioactive emissions and fluid leaks from the therapeutic particles stored therein.

34. A treatment delivery device, comprising:

a housing having a protective shielding material, wherein the housing is sized and shaped to couple to an instrument;

a vial compartment disposed within the housing, wherein the vial compartment is configured to receive a therapeutic media therein, and wherein the protective shielding material inhibits exposure of the therapeutic media external from the housing;

a fluid reservoir disposed within the housing, wherein the fluid reservoir is configured to receive a fluid medium therein, and wherein the fluid reservoir is in fluidic communication with the vial compartment; and

an actuator movably coupled to the housing such that moving the actuator delivers the fluid medium to the vial compartment;

wherein the actuator is configured to deliver a mixture of the fluid medium and the therapeutic media to the instrument.

35. A treatment delivery device, comprising:

a base plate;

a housing coupled to the base plate, the housing defining a compartment for storing therapeutic substances, the housing formed of a material configured to inhibit radioactive emissions from the compartment;

a reservoir coupled to the base plate, the reservoir defining a storage for storing fluid substances; and

a handle assembly coupled to the base plate, the handle assembly is movably coupled to the housing, wherein the handle assembly is configured to generate a negative pressure within the housing and the reservoir such that moving the handle assembly suctions the fluid substances from the reservoir and the therapeutic substances from the housing.

36. A handheld delivery device, comprising:

a first chamber sized and shaped to receive a first device including therapeutic particles stored therein;

a second chamber sized and shaped to receive a second device including fluid medium stored therein;

a distal end including a manifold and a needle disposed therein, the distal end is coupled to the first chamber and the second chamber such that the manifold is in fluid communication with the first device and the second device, wherein the needle extends into the first chamber and coupled to the first device received within the first chamber,

wherein the therapeutic particles stored within the first device and the fluid medium stored within the second device are received at the manifold thereby forming a mixture therein.

37. The handheld delivery device of any preceding claim, wherein the first device is punctured by the needle when received within the first chamber.

38. The handheld delivery device of any preceding claim, wherein the first device is a vial assembly including an inner chamber for storing the therapeutic particles therein and a protective shield disposed about the inner chamber for inhibiting radioactive emissions generated by the therapeutic particles.

39. The handheld delivery device of claim 38, wherein the vial assembly includes a handle and a plunger coupled to the inner chamber such that translation of the plunger into the inner chamber delivers the therapeutic particles into the manifold via the needle in response to actuation of the handle.

40. The handheld delivery device of claim 39, wherein the handle is configured to translate the plunger in response to a rotation of the handle.

41. The handheld delivery device of claim 39, wherein the handle is configured to translate the plunger in response to a translation of the handle.

42. The handheld delivery device of claim 39, further comprising a safety tab removably coupled to the vial assembly and configured to inhibit translation of the plunger thereby preventing delivery of the therapeutic particles into the manifold.

43. The handheld delivery device of claim 39, wherein the safety tab is configured to be decoupled from the vial assembly to permit translation of the plunger in response to applying a force thereto.

44. The handheld delivery device of any preceding claim, wherein the first device includes a retention mechanism and the first chamber includes a corresponding retention mechanism such that the first device is securely fastened to the first chamber in response to the retention mechanism of the first device coupling the corresponding retention mechanism of the first chamber.

45. The handheld delivery device of claim 44, wherein the retention mechanism of the first device comprises a depressible button and the corresponding retention mechanism of the first chamber is an aperture sized and shaped to receive the depressible button therethrough.

46. The handheld delivery device of any preceding claim, further comprising a catheter hub disposed within the distal end and in fluid communication with the manifold, wherein the catheter hub is configured to couple the manifold to an external device such that the external device is in fluid communication with the mixture.

47. The handheld delivery device of any preceding claim, wherein the second device is a fluid reservoir and the fluid medium stored therein is saline or saline-contrast mixture.

48. The handheld delivery device of any preceding claim, further comprising one or more of a dosimeter, a linear encoder, an optical sensor, a linear displacement sensor, a flow sensor, an ultrasonic sensor, a magnetic encoder, a laser distance sensor, an inductance sensor, a radial encoder, volumetric sensor, and a mechanical transducer.

49. The handheld delivery device of claim 48, further comprising one or more display outputs communicatively coupled to one or more of the dosimeter, linear encoder, optical sensor, linear displacement sensor, flow sensor, ultrasonic sensor, magnetic encoder, laser distance sensor, inductance sensor, radial encoder, volumetric sensor, and mechanical transducer.

50. The handheld delivery device of claim 48, further comprising a remote display communicatively coupled to one or more of the dosimeter, linear encoder, optical sensor, linear displacement sensor, flow sensor, ultrasonic sensor, magnetic encoder, laser distance sensor, inductance sensor, radial encoder, volumetric sensor, and mechanical transducer.

51. The handheld delivery device of claim 50, wherein the remote display comprises a smart device, a tablet, or a computer.

52. A handheld delivery device, comprising:

a housing including a manifold disposed therein;

a first device disposed within the housing and storing a first fluid medium, wherein the first device is in fluid communication with the manifold;

a second device disposed within the housing and storing a second fluid medium, wherein the second device is in fluid communication with the manifold;

a syringe at least partially disposed within the housing, the syringe including:

an external chamber,

an internal chamber disposed within the external chamber and storing therapeutic particles therein, and

a needle disposed within the external chamber and in fluid communication with the manifold such that the external chamber is fluidly coupled to the manifold via the needle,

wherein:

the internal chamber is configured to translate within the external chamber and engage the needle such that the internal chamber fluidly couples to the manifold when engaged with the needle; and

the therapeutic particles, the first fluid medium, and the second fluid medium are received at the manifold thereby forming a mixture therein.

53. The handheld delivery device of any preceding claim, further comprising one or more of a dosimeter, a linear encoder, an optical sensor, a linear displacement sensor, a flow sensor, an ultrasonic sensor, a magnetic encoder, a laser distance sensor, an inductance sensor, a radial encoder, volumetric sensor, and a mechanical transducer.

54. The handheld delivery device of claim 53, further comprising one or more display outputs communicatively coupled to one or more of the dosimeter, linear encoder, optical sensor, linear displacement sensor, flow sensor, ultrasonic sensor, magnetic encoder, laser distance sensor, inductance sensor, radial encoder, volumetric sensor, and mechanical transducer.

55. The handheld delivery device of claim 53, further comprising a remote display communicatively coupled to one or more of the dosimeter, linear encoder, optical sensor, linear displacement sensor, flow sensor, ultrasonic sensor, magnetic encoder, laser distance sensor, inductance sensor, radial encoder, volumetric sensor, and mechanical transducer.

56. The handheld delivery device of claim 55, wherein the remote display comprises a smart device, a tablet, or a computer.

57. The handheld delivery device of any preceding claim, wherein the syringe includes a handle extending outwardly from the housing such that the handle is accessible externally from the housing.

58. The handheld delivery device of any preceding claim, wherein the internal chamber is configured to translate within the external chamber and engage the needle in response to actuation of the handle external of the housing.

59. The handheld delivery device of any preceding claim, wherein the housing includes a first switch communicatively coupled to the first device such that actuation of the first switch automates delivery of the first fluid medium to the manifold.

60. The handheld delivery device of claim 59, wherein the housing includes a second switch communicatively coupled to the second device such that actuation of the second switch automates delivery of the second fluid medium to the manifold.

61. The handheld delivery device of claim 60, wherein the housing includes a third switch communicatively coupled to the syringe such that actuation of the third switch translates the internal chamber within the external chamber.

62. A sterile container assembly comprising:

a top housing including a closed end and an open end, wherein the closed end of the top housing includes material configured to form a liquid seal therein and the open end of the top housing includes a top mating system;

a bottom housing including a closed end and an open end, wherein the closed end of the bottom housing includes material configured to form a liquid seal therein and the open end of the bottom housing includes a bottom mating system;

wherein:

the top housing and the bottom housing are sized and shaped to receive a device therein when the open end of the top housing couples to the open end of the bottom housing via the top mating system engaging the bottom mating system; and

a gasket seal is formed between the open end of the top housing and the open end of the bottom housing in response to the top mating system engaging the bottom mating system.

63. The sterile container assembly of claim 62, wherein the top housing and the bottom housing are configured to inhibit leaks of therapeutic particles externally therefrom when the gasket seal is formed between the open end of the top housing and the open end of the bottom housing.

64. The sterile container assembly of claim 62, wherein the closed end of the top housing and the closed end of the bottom housing are configured to facilitate steam penetration through the liquid seals formed thereon when the open end of the top housing is coupled to the open end of the bottom housing.