

CLAIMS

1. An apparatus for printing a vein map onto a patient's skin comprising:
an ultrasonic probe configured to identify a location of a target vein beneath the patient's skin via ultrasound; and
a print head coupled to the ultrasonic probe and configured to:
receive the location; and
using the location, print the vein map onto the patient's skin above the location such that the vein map indicates the location of the target vein within the patient.
2. The apparatus of claim 1, wherein the vein map comprises a two-dimensional vein map that indicates:
the location of the target vein within the patient below the vein map; and
a width of the target vein.
3. The apparatus of claim 1, wherein the vein map comprises a three-dimensional vein map that indicates:
the location of the target vein within the patient below the vein map;
a width of the target vein; and
a depth of the target vein within the patient.
4. The apparatus of claim 3, wherein the three-dimensional vein map comprises one or more colors that indicate one or more depths of the target vein within the patient.
5. The apparatus of claim 3, wherein the three-dimensional vein map comprises one or more patterns that indicate one or more depths of the target vein within the patient.
6. The apparatus of claim 1, wherein the vein map comprises an antimicrobial ink printed onto the patient's skin.
7. The apparatus of claim 1, wherein the vein map further indicates a second location for a second target vein beneath the patient's skin.

8. A system for printing a vein map onto a patient's skin comprising:
 - a probe configured to identify a location of a target vein beneath the patient's skin; and
 - a printer configured to:
 - receive the location; and
 - using the location, print the vein map onto the patient's skin to indicate the location.
9. The system of claim 8, wherein the vein map comprises a two-dimensional vein map that indicates:
 - the location of the target vein within the patient below the vein map; and
 - a width of the target vein.
10. The system of claim 8, wherein the vein map comprises a three-dimensional vein map that indicates:
 - the location of the target vein within the patient below the vein map;
 - a width of the target vein; and
 - a depth of the target vein within the patient.
11. The system of claim 10, wherein the three-dimensional vein map comprises one or more colors that indicate one or more depths of the target vein within the patient.
12. The system of claim 11, wherein the three-dimensional vein map comprises:
 - a first color that indicates a superficial target vein; and
 - a second color that indicates a deep target vein.
13. The system of claim 10, wherein the three-dimensional vein map comprises one or more patterns that indicate one or more depths of the target vein within the patient.
14. The system of claim 8, wherein the probe identifies the location of the target vein through use of an imaging technique comprising at least one of:
 - ultrasound;
 - MRI;

NIR;
FNIR;
X-rays;
radiography;
fluoroscopy;
elastography;
photoacoustic imaging;
tomography; and
nuclear imaging.

15. The system of claim 14, wherein:
the probe comprises an ultrasonic probe that utilizes the Doppler effect to:
identify the location of the target vein; and
differentiate the target vein from an artery.
16. The system of claim 15, wherein:
the ultrasonic probe is automated to scan over the patient's skin and identify the location of the target vein; and
the printer is automated to receive the location and print an automated vein map onto the patient's skin to indicate the location.
17. A method for printing a vein map onto a patient's skin comprising:
identifying a location of a target vein below the patient's skin with a probe; and
printing a vein map onto the patient's skin that indicates the location of the target vein within the patient.
18. The method of claim 17, further comprising:
performing an initial scan of the patient's skin with an ultrasonic probe to identify the location of the target vein;
performing a subsequent scan of the patient's skin with the ultrasonic probe to verify the location of the target vein; and

printing the vein map onto the patient's skin during the subsequent scan with a print head coupled to the ultrasonic probe that is configured to receive the location.

19. The method of claim 17, further comprising:
 - performing a scan of the patient with the probe to identify the location of the target vein below the patient's skin; and
 - printing the vein map onto the patient's skin with a printer that is configured to receive the location and print the vein map onto the patient's skin.
20. The method of claim 17, wherein the vein map comprises at least one of:
 - a two-dimensional vein map that indicates:
 - the location of the target vein within the patient below the vein map; and
 - a width of the target vein; and
 - a three-dimensional vein map that indicates:
 - the location of the target vein within the patient below the vein map;
 - a width of the target vein; and
 - a depth of the target vein within the patient.