CLAIMS

1. An invasive medical device for insertion into a patient, the invasive medical device comprising:

a hypodermic needle comprising a stainless steel elongate shaft having a diameter, an outer surface, a distal tip, and a proximal end, at least a portion of the elongate shaft having a first magnetic region having a first magnetic field B1 and a first length L1 and spaced at a distance d1 from a second magnetic region having a second magnetic field B2 and second length L2, wherein B1 and B2 are not equal, L1 and L2 are not equal and the first magnetic field and the second magnetic field are detectable by an ultrasound system.

2. The invasive medical device of claim 1, wherein at least one of the first magnetic region and the second magnetic region is selected from the group consisting of a layer of ferromagnetic metal, a layer of paramagnetic metal, a notch in the outer surface of the shaft, a spot weld of magnetic metal, a ferrule and combinations thereof.

3. The invasive medical device of claim 2, wherein the elongate shaft has a third magnetic region spaced from the second magnetic region at a distance d2 and having a third magnetic field B3 and a third length L3, wherein L2 and L3 are not equal.

4. The invasive medical device of claim 3, wherein at least one of the first magnetic region, the second magnetic region and the third magnetic region comprise martensitic steel.

5. The invasive medical device of claim 3, wherein the first magnetic region and the second magnetic region are encoded with data.

6. The invasive medical device of claim 5, wherein the data includes information about the invasive medical device, the information including one or more of diameter, length and type of device.

7. The invasive medical device of claim 3, wherein the first magnetic region has a first diameter, the second magnetic region has a second diameter and the third magnetic region has a third diameter and at least one of the first diameter, the second diameter and the third diameter is larger than the diameter of the shaft.

8. The invasive medical device of claim 3, wherein the first magnetic region has a pole orientation and the second magnetic region has a pole orientation, and the pole orientation of the first magnetic region is different than the pole orientation of the second magnetic region.

9. A system for determining relative position of a hypodermic needle comprising the invasive medical device of any one of claims 1-8 and a three-dimensional grid array of magnetometers, wherein the system is configured to determine a position of the first magnetic region and the second magnetic region.

10. A system for determining relative position of a hypodermic needle, the system comprising the invasive medical device of any one of claims 1-8 and a three-dimensional grid array of magnetometers, wherein the system is configured to determine an x, y, or z position of the first magnetic region and the second magnetic region.

11. The system of claim 9 and 10, wherein the hypodermic needle is part of a hypodermic needle subassembly further including a needle hub mounted to the proximal end of the hypodermic needle, and the intravenous catheter tubing is part of a catheter adapter subassembly, the catheter adapter subassembly including a magnetic feature.

12. The system of claim 11, wherein the three-dimensional grid array of magnetometers is part of an ultrasound system configured to detect magnetic field strength, length and spacing of the first magnetic region, the second magnetic region and a third magnetic region.

13. The system of claim 12, wherein the ultrasound system calculates the position of the hypodermic needle.

14. The system of claim 13, wherein the system is configured to determine relative motion of the hypodermic needle and the catheter adapter subassembly.

15. The system of claim 13, wherein the system is configured to determine position and orientation of the first magnetic region and the second magnetic region.

16. A method obtaining information about an invasive medical device having a distal tip, the method comprising:

encoding magnetic data on the medical device of claim 5; and reading the data encoded on the invasive medical device.

17. The method of claim 16, wherein data comprises at least one of diameter of the medical device, length of the medical device and type of the medical device.

18. The method of claim 16, wherein reading data from the medical device includes reading position of the magnetic fields with respect to the distal tip of the needle.

19. The method of claim 16, wherein reading the data utilizes a three-dimensional array of magnetometers as part of an ultrasound system, and the ultrasound system obtains a distance from the array of magnetometers to at least one of the magnetic fields.