CLAIMS

1. A system to prevent occlusion of an intravenous catheter, comprising:

a housing, comprising:

one or more transmitters, wherein the one or more transmitters transmit first energy waves along a length of an intravenous catheter of a catheter adapter at a first frequency, wherein the one or more transmitters also transmit second energy waves along the length of the intravenous catheter of the catheter adapter at a second frequency, wherein the second frequency is greater than the first frequency; and

one or more transducers configured to detect a portion of the first energy waves that are reflected back from the intravenous catheter; and

a processor coupled to the transmitter, wherein the processor receives an electrical signal corresponding to the portion of the first energy waves that are reflected back from the intravenous catheter and compares the electrical signal to a baseline electrical signal to determine a difference between the electrical signal and the baseline electrical signal,

wherein the one or more transmitters transmit the second energy waves along the length of the intravenous catheter at the second frequency in response to the difference between the electrical signal and the baseline electrical signal being below a threshold value, wherein the one or more transmitters are prevented from transmitting the second energy waves along the length of the intravenous catheter at the second frequency in response to the difference between the electrical signal and the baseline electrical signal meeting the threshold value.

2. The system of claim 1, wherein the one or more transducers comprise a first transducer and a second transducer, wherein the first transducer comprises a first piezoelectric crystal, wherein the second transducer comprises a second piezoelectric crystal, wherein the first and second piezoelectric crystals are embedded or encapsulated in a wall of the inner lumen.

3. The system of claim 1, wherein an outer surface of a distal tip of the intravenous catheter comprises a plurality of facets.

4. The method of claim 1, wherein a wall forming an inner lumen of the intravenous catheter comprises one or more inner curved portions that extend proximally from a portion of a distal tip of the intravenous catheter configured to contact an introducer needle.

5. The system of claim 1, wherein the one or more transmitters transmit the second energy waves along the length of the intravenous catheter of the catheter adapter at the second frequency in pulses.

6. The system of claim 1, wherein the second frequency is between 300 and 700 kHz.

7. The system of claim 1, wherein the first frequency is less than or equal to 300 kHz.

8. A system to prevent occlusion of an intravenous catheter, comprising:

a housing, comprising:

one or more transmitters, wherein the one or more transmitters transmit first energy waves along a length of an intravenous catheter of a catheter adapter at a first frequency, wherein the one or more transmitters also transmit second energy waves along the length of the intravenous catheter of the catheter adapter at a second frequency, wherein the second frequency is greater than the first frequency, wherein a wall forming an inner lumen of the intravenous catheter comprises one or more inner curved portions that extend proximally from a portion of a distal tip of the intravenous catheter configured to contact an introducer needle; and

one or more transducers configured to detect a portion of the first energy waves that are reflected back from the intravenous catheter; and

a processor coupled to the transmitter, wherein the processor receives an electrical signal corresponding to the portion of the first energy waves that are reflected back from the intravenous catheter and compares the electrical signal to a baseline electrical signal to determine a difference between the electrical signal and the baseline electrical signal.

9. The system of claim 8, wherein the one or more transmitters transmit the second energy waves along the length of the intravenous catheter at the second frequency in response to the difference between the electrical signal and the baseline electrical signal being below a threshold value.

10. The system of claim 9, wherein the one or more transmitters are prevented from transmitting the second energy waves along the length of the intravenous catheter at the second frequency in response to the difference between the electrical signal and the baseline electrical signal meeting a threshold value.

11. The system of claim 8, wherein the one or more transducers comprise a first transducer and a second transducer, wherein the first transducer comprises a first piezoelectric crystal, wherein the second transducer comprises a second piezoelectric crystal, wherein the first and second piezoelectric crystals are embedded or encapsulated in a wall of the inner lumen.

12. The system of claim 8, wherein an outer surface of a distal tip of the intravenous catheter comprises a plurality of facets.

13. The method of claim 8, wherein a wall forming an inner lumen of the intravenous catheter comprises one or more inner curved portions that extend proximally from a portion of a distal tip of the intravenous catheter configured to contact an introducer needle.

14. The system of claim 8, wherein the one or more transmitters transmit the second energy waves along the length of the intravenous catheter of the catheter adapter at the second frequency in pulses.

15. The system of claim 8, wherein the second frequency is between 300 and 700 kHz.

16. The system of claim 8, wherein the first frequency is less than or equal to 300 kHz.