

CLAIMS

1. A delivery device to deliver a tubular instrument into a catheter extending distally from a catheter adapter, the delivery device comprising:
 - a housing configured to couple to the catheter adapter;
 - the tubular instrument configured to insert through the catheter, the tubular instrument comprising a distal end, a proximal end, and a lumen extending between the distal end and the proximal end, wherein the distal end comprises a distal tip, wherein the distal tip is closed, wherein the tubular instrument is configured to advance distally with respect to the housing; and
 - a pressure-sensitive valve disposed at the distal tip, wherein the pressure-sensitive valve is configured to move from a closed position to an open position in response to a pressure differential within the lumen being within a predetermined pressure window.
2. The delivery device of claim 1, wherein the tubular instrument comprises a plurality of holes within the distal end and the proximal to the pressure-sensitive valve.
3. The delivery device of claim 1, wherein the pressure-sensitive valve is monolithically formed with the tubular instrument as a single unit.
4. The delivery device of claim 1, wherein the pressure-sensitive valve comprises a slit.
5. The delivery device of claim 1, wherein the pressure-sensitive valve comprises a cross slit.
6. The delivery device of claim 5, wherein a length of the cross slit extends across an entirety of a width of the distal end.
7. The delivery device of claim 5, wherein a length of the cross slit extends only partially across a width of the distal end.

8. A delivery device to deliver a tubular instrument into a catheter extending distally from a catheter adapter, the delivery device comprising:
 - a housing configured to couple to a catheter adapter;
 - the tubular instrument configured to insert through the catheter, the tubular instrument comprising a distal end, a proximal end, a lumen extending between the distal end and the proximal end, and a linear slit within the distal end, wherein the distal end comprises a distal tip, wherein the distal tip is closed, wherein the tubular instrument is configured to advance distally with respect to the housing, wherein the linear slit is in a closed position, wherein the linear slit is configured to move from the closed position to an open position in response to a predetermined pressure differential within the lumen.
9. The delivery device of claim 8, wherein the linear slit is oriented parallel to a longitudinal axis of the tubular instrument.
10. The delivery device of claim 8, wherein the distal end of the tubular instrument is constructed of silicon.
11. The delivery device of claim 8, wherein the distal end of the tubular instrument is constructed of polypropylene.
12. A method of blood collection, comprising:
 - inserting a catheter of a catheter assembly into vasculature of a patient, wherein the catheter assembly comprises a catheter adapter and a catheter extending distally from the catheter adapter;
 - coupling a delivery device to the catheter adapter, wherein the delivery device comprises a housing and a tubular instrument, wherein the tubular instrument comprises a distal end, a proximal end, and a lumen extending through the distal end and the proximal

end, wherein the distal end comprises a closed distal tip, wherein the proximal end is secured within the housing, wherein the tubular instrument is disposed within the housing and configured to advance distally with respect to the housing, wherein the delivery device comprises a pressure-sensitive valve disposed within the distal end and in a closed position, wherein the pressure-sensitive valve is configured to move from the closed position to an open position in response to a predetermined pressure differential within the lumen;

advancing the delivery device through the catheter, comprising advancing the tubular instrument distally with respect to the housing; and

after advancing the delivery device through the catheter, activating a blood collection container, wherein in response to activating the blood collection device, the predetermined vacuum pressure within the lumen is created and the pressure-sensitive valve moves from the closed position to the open position.

13. The method of claim 12, wherein the pressure-sensitive valve comprises a slit at the distal tip, wherein the slit is in the closed position to prevent fluid from flowing through the lumen.
14. The method of claim 12, wherein the tubular instrument comprises a plurality of holes within the distal end and the proximal to the slit.
15. The method of claim 12, wherein the slit comprises a cross slit.
16. The method of claim 12, wherein the pressure-sensitive valve comprises a linear slit oriented parallel to a longitudinal axis of the tubular instrument and within the distal end.
17. The method of claim 16, wherein the distal end of the tubular instrument is constructed of silicon.

18. The method of claim 16, wherein the distal end of the tubular instrument is constructed of polypropylene.