WHAT IS CLAIMED IS:

1. A vascular access device, comprising:

a housing, comprising a proximal end, a distal end, and a slot between the proximal end and the distal end;

a protrusion fixed within the housing distal to the advancement element;

an advancement element extending through the slot and configured to move linearly along the slot between a retracted position and an advanced position, wherein a distal end of the advancement element comprises a recess configured to receive the protrusion when the advancement element is in the advanced position; and

a probe comprising a first end and a second end, wherein the probe is disposed between the protrusion and an inner surface of the housing, wherein in response to movement of the advancement element from the retracted position to the advanced position, the second end of the probe is advanced beyond the distal end of the housing.

2. The vascular access device of claim 1, wherein an inner surface of the housing comprises a groove disposed within the housing between the proximal end of the housing and the distal end of the housing, wherein the probe is configured to move within the groove in response to the advancement element moving linearly along the slot between the retracted position and the advanced position.

3. The vascular access device of claim 2, wherein the groove is linear.

4. The vascular access device of claim 1, wherein the advancement element comprises an arc-shaped channel, wherein the probe extends through the arc-shaped channel, wherein the first end of the probe is fixed, wherein in response to movement of the advancement element a first distance, the second end of the probe is configured to advance distally a second distance, wherein the second distance is at least twice the first distance, wherein the groove is a first groove, wherein the inner surface of the housing comprises a second groove between the proximal end of the housing and the distal end of the housing and generally parallel to the first groove, wherein the probe extends through the second groove.

5. A vascular access device, comprising:

a housing, comprising a proximal end, a distal end, and a slot between the proximal end and the distal end;

an advancement element extending through the slot and configured to move linearly along the slot between a retracted position and an advanced position, wherein the advancement element comprises a distally-extending arm, the distally-extending arm comprising a rectangular cuboid; and

a probe comprising a first end and a second end, wherein the probe is disposed between the distally-extending arm and an inner surface of the housing, wherein in response to movement of the advancement element from the retracted position to the advanced position, the second end of the probe is advanced beyond the distal end of the housing, and wherein a bottom surface of the distally-extending arm is configured to contact the probe during advancement of the advancement element and the probe in a distal direction to reduce buckling of the probe.

6. The vascular access device of claim 5, wherein the housing comprises a recess configured to receive the distally-extending arm when the advancement element is in the advanced position.

7. The vascular access device of claim 5, wherein an inner surface of the housing comprises a groove disposed within the housing between the proximal end of the housing and the distal end of the housing, wherein the probe is configured to move within the groove in response to the advancement element moving linearly along the slot between the retracted position and the advanced position.

8. The vascular access device of claim 7, wherein the groove is linear.

9. The vascular access device of claim 7, wherein the advancement element comprises an arc-shaped channel, wherein the probe extends through the arc-shaped channel, wherein the first end of the probe is fixed, wherein in response to movement of the advancement element a first distance, the second end of the probe is configured to advance distally a second distance, wherein the second distance is at least twice the first distance, wherein the groove is a first groove, wherein the inner surface of the housing comprises a

second groove between the proximal end of the housing and the distal end of the housing and generally parallel to the first groove, wherein the probe extends through the second groove.