

PROSPECTUS SUPPLEMENT
(To Prospectus dated December 22, 2023)**SeaStar Medical Holding Corporation****Up to \$7,433,000 of
Common Stock**

We previously entered into an at the market offering agreement (the "Offering Agreement") with H.C. Wainwright & Co., LLC ("Wainwright") pursuant to which we may offer and sell shares of our common stock from time to time through Wainwright, acting as sales agent, under our prospectus supplement, dated August 20, 2024, and accompanying base prospectus (the "Prospectus"), having an aggregate offering price of up to \$25,000,000. As of April 1, 2025, we have sold \$5,531,622 of our common stock pursuant to the Offering Agreement, which leaves \$19,468,378 of common stock available under the Prospectus. This prospectus supplement should be read in conjunction with the Prospectus, and is qualified by reference thereto, except to the extent that the information herein amends or supersedes the information contained in the Prospectus. This prospectus supplement is not complete without, and may only be delivered or utilized in connection with, the Prospectus, and any future amendments or supplements thereto.

We are now subject to General Instruction I.B.6 of Form S-3, which limits the amounts that we may sell under the registration statement of which this prospectus supplement and the Prospectus form a part. The aggregate market value of our common stock held by non-affiliates pursuant to General Instruction I.B.6 of Form S-3 is approximately \$22,299,199, which was calculated based on approximately 9,176,625 shares of our outstanding common stock held by non-affiliates on April 1, 2025 at a price of \$2.43 per share, the closing price of our common stock on March 26, 2025. During the 12 calendar months prior to, and including, the date of this prospectus supplement, we have not sold any securities pursuant to General Instruction I.B.6 of Form S-3. As a result of the limitations of General Instruction I.B.6, and in accordance with the terms of the sales agreement, we are registering the offer and sale of shares of our common stock having an aggregate offering price of up to \$7,433,000 from time to time through Wainwright.

Our common stock is listed on The Nasdaq Capital Market under the symbol "ICU." On March 31, 2025, the last reported sale price of our common stock on The Nasdaq Capital Market was \$1.66 per share.

Investing in our securities involves a high degree of risk. See "Risk Factors" beginning on page 3 of the Prospectus, the "Risk Factors" section in our most recent Annual Report on Form 10-K, which is incorporated by reference into this prospectus supplement and the Prospectus, and under similar headings in the other documents that are filed after the date hereof and incorporated by reference into this prospectus supplement and the Prospectus.

Neither the Securities and Exchange Commission nor any state securities commission has approved or disapproved of these securities or passed upon the adequacy or accuracy of this prospectus supplement or the Prospectus. Any representation to the contrary is a criminal offense.

H.C. Wainwright & Co.
The date of this prospectus supplement is April 2, 2025.