As filed with the Securities and Exchange Commission on December 6, 2024

Registration No. 333-

UNITED STATES
SECURITIES AND EXCHANGE COMMISSION

Washington, D.C. 20549

FORM S-1

REGISTRATION STATEMENT UNDER THE

SECURITIES ACT OF 1933

TRANSCODE THERAPEUTICS, INC.

(Exact name of registrant as specified in its charter)

Delaware	2834	81-1065054
(State or other jurisdiction of incorporation or organization)	(Primary Standard Industrial Classification Code Number)	(I.R.S. Employer Identification No.)

6 Liberty Square - #2382
Boston, MA 02109
(857-837-3099)

(Address, including zip code, and telephone number, including area code, of registrant's principal executive offices)

Thomas A. Fitzgerald
Interim Chief Executive Officer and Chief Financial Officer
TransCode Therapeutics, Inc.
6 Liberty Square, #2382
Boston, MA 02109
(857) 837-3099

(Name, address, including zip code, and telephone number, including area code, of agent for service)

Copy to:

Michael Bison
Finnbarr Murphy
Goodwin Procter LLP
100 Northern Avenue
Boston, MA 02210
(617) 570-1000

Approximate date of commencement of proposed sale to the public: From time to time after the Registration Statement becomes effective.

If any of the securities being registered on this form are to be offered on a delayed or continuous basis pursuant to Rule 415 under the Securities Act of 1933, check the following box. ☐

If this form is filed to register additional securities for an offering pursuant to Rule 462(b) under the Securities Act, check the following box and list the Securities Act registration statement number of the earlier effective registration statement for the same offering. ☐

If this form is a post-effective amendment filed pursuant to Rule 462(c) under the Securities Act, check the following box and list the Securities Act registration statement number of the earlier effective registration statement for the same offering. ☐

If this Form is a post-effective amendment filed pursuant to Rule 462(d) under the Securities Act, check the following box and list the Securities Act registration statement number of the earlier effective registration statement for the same offering. ☐

Indicate by check mark whether the registrant is a large accelerated filer, an accelerated filer, a non-accelerated filer, a smaller reporting company, or an emerging growth company. See the definitions of "large accelerated filer," "accelerated filer," "smaller reporting company," and "emerging growth company" in Rule 12b-2 of the Exchange Act.

Large accelerated filer	☐	Accelerated filer	☐
Non-accelerated filer	☒	Smaller reporting company	☒
		Emerging growth company	☒

If an emerging growth company, indicate by check mark if the registrant has elected not to use the extended transition period for complying with any new or revised financial accounting standards provided pursuant to Section 7(a)(2)(B) of the Securities Act. ☐

The Registrant hereby amends this registration statement on such date or dates as may be necessary to delay its effective date until the Registrant shall file a further amendment which specifically states that this registration statement shall thereafter become effective in accordance with Section 8(a) of the Securities Act of 1933 or until the registration statement shall become effective on such date as the Securities and Exchange Commission, acting pursuant to said Section 8(a), may determine.

The information in this prospectus is not complete and may be changed. The selling stockholders named in this prospectus may not sell these securities until the registration statement becomes effective. This prospectus is not an offer to sell these securities, and the selling stockholders named in this prospectus are not soliciting offers to buy these securities in any jurisdiction where the offer for sale is not permitted.

SUBJECT TO COMPLETION, DATED DECEMBER 6, 2024

PROSPECTUS

TRANSCODE

THERAPEUTICS™

173,033 Shares of Common Stock

470,007 shares of Common Stock underlying the Pre-Funded Warrants

Up to 4,050,953 shares of Common Stock underlying the Series C Warrants

Up to 12,152,856 shares of Common Stock underlying the Series D Warrants

This prospectus relates to the resale by the selling stockholders identified in this prospectus under the section "*The Selling Stockholders*," or their pledgees, donees, transferees or other successors in interest, from time to time, of (i) 173,033 shares of our common stock, par value $0.0001 per share, ("Common Stock") issued in a private placement of our securities (the "PIPE"), (ii) 470,007 shares of Common Stock (the "PIPE PFW Shares") issuable upon exercise of pre-funded warrants (each, a "PIPE PFW"), (iii) up to 4,050,953 common shares underlying warrants (the "Series C Common Warrants") to purchase Common Stock (the "Series C Common Warrant Shares") and (iv) up to 12,152,856 common shares underlying warrants to purchase Common Stock (the "Series D Common Warrants" and together with the Series C Common Warrants, the "Common Warrants"; the Common Warrants together with the PIPE PFW, the "Warrants") and together with the Series C Common Warrant Shares, the "Common Warrant Shares," the Common Warrant Shares together with the PIPE PFW Shares, the "Warrant Shares") sold to the Selling Stockholders and certain of their affiliates (the "Selling Stockholders") pursuant to the stock purchase agreement dated as of November 26, 2024, (the "PIPE SPA") by and between TransCode Therapeutics, Inc. (the "Company"), and the Selling Stockholders. We are registering the offer, sale and resale, from time to time, of the Common Stock issued in the PIPE, the PIPE PFW Shares and the Warrant Shares (collectively, the "Resale Shares") on behalf of the Selling Stockholders.

Each Series C Warrant has an initial exercise price per share of $15.675 and will be exercisable beginning on the date on which Stockholder Approval (as defined below) is received and deemed effective (the "Initial Exercise Date" or the "Stockholder Approval Date"). The Series C Warrants will expire on the five-year anniversary of the Initial Exercise Date. Additionally, the Series C Warrants provide for an adjustment to the exercise price and number of shares underlying such the Series C Warrants upon the Company's issuance of common shares or common share equivalents at a price per share that is less than the exercise price of the Series C Warrants, subject to a floor price of $2.4882 (the "Floor Price").

The Series D Warrants have an initial exercise price per share of $15.675 and will be exercisable beginning on the Initial Exercise Date. The Series D Warrants will expire two and one-half years after the Initial Exercise Date. Under an alternative cashless exchange provision in the Series D Warrants, holders thereof have the right to receive an aggregate number of shares equal to the product of (i) the aggregate number of common shares that would be issuable upon a cash exercise of the Series D Warrants and (ii) 3.0.

In addition, on the 11th trading day following each of (i) the later of (A) the Stockholder Approval Date and (B) the Effective Date (as that term is defined in the PIPE SPA) and (ii) each subsequent date that a Registration Statement (as that term is defined in the PIPE SPA) is declared effective by the Securities and Exchange Commission, if any (each such trading day, a "Reset Date"), the Series C Warrants and the Series D Warrants contain a reset of the exercise price to a price equal to the lesser of (i) the then applicable exercise price and (ii) the greater of the Floor Price and the lowest volume weighted average price for the ten trading days immediately preceding the Reset Date. Upon such reset of the exercise price, the number of

shares issuable under the Common Warrants shall be increased such that the aggregate exercise price of the Common Warrants shall remain unchanged following such reset.

The issuance of shares of Common Stock upon exercise of the Common Warrants is subject to stockholder approval under applicable rules and regulations of The Nasdaq Stock Market LLC ("Nasdaq") ("Stockholder Approval" and the date on which Stockholder Approval is received and deemed effective, the "Stockholder Approval Date"). The Company intends to hold a shareholder meeting to obtain Stockholder Approval within 70 days following the closing of the PIPE.

The Selling Stockholders may resell or dispose of the Resale Shares, or interests therein, at fixed prices, at prevailing market prices at the time of sale or at prices negotiated with purchasers, to or through underwriters, broker-dealers, agents, or through any other means described in the section of this prospectus titled "*Plan of Distribution*". The Selling Stockholders will each bear their respective commissions and discounts, if any, attributable to the sale or disposition of the Resale Shares, or interests therein, held by such Selling Stockholder. We will bear all other costs, expenses and fees in connection with the registration of the resale of the Resale Shares. We will not receive any of the proceeds from the sale by the Selling Stockholders of the Common Stock issued in the PIPE. We will, however, receive the net proceeds of any Warrants exercised for cash.

We are an "emerging growth company" as defined in Section 2(a) of the Securities Act of 1933, as amended (the "Securities Act"), and, as such, have elected to comply with certain reduced disclosure and regulatory requirements.

Our Common Stock is listed on The Nasdaq Capital Market, or Nasdaq, under the symbol "RNAZ." On December 5, 2024, the last reported sale price of our Common Stock was $8.70 per share. You are urged to obtain current market quotations for our Common Stock.

We are not in compliance with certain listing requirements for continued listing of our stock on The Nasdaq Capital Market, or the Exchange. There can be no assurance that we will be successful in our efforts to maintain our Nasdaq listing. If our common stock ceases to be listed for trading on The Nasdaq Capital Market, we expect that our common stock would be traded on one of the three tiered marketplaces of the OTC Markets Group. See "Risk Factors" — "*We could lose our listing on the Nasdaq Capital Market. The loss of our Nasdaq listing would in all likelihood make our common stock significantly less liquid and adversely affect its value*" for more details.

Investing in our securities involves a high degree of risk. You should review carefully the risks and uncertainties described under the heading "*Risk Factors*" contained in this prospectus and under similar headings in the other documents that are incorporated by reference into this prospectus as described on page 16 of this prospectus.

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

The date of this Prospectus is , 2024.

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About This Prospectus

This prospectus provides you with a general description of the Resale Shares that may be resold by the Selling Stockholders. In certain circumstances, we may provide a prospectus supplement that will contain specific information about the terms of a particular offering by the Selling Stockholders. We also may provide a prospectus supplement that may contain material information relating to these offerings. The prospectus supplement may also add information to, or update or change information contained in, this prospectus. To the extent there is a conflict between the information contained in this prospectus and any prospectus supplement, you should rely on the information in the prospectus supplement, provided that if any statement in one of these documents is inconsistent with a statement in another document having a later date — for example, a document incorporated by reference in this prospectus or any prospectus supplement — the statement in the later-dated document modifies or supersedes the earlier statement.

You should read both this prospectus and any applicable prospectus supplement together with the additional information about our company to which we refer you in the sections of this prospectus titled "*Where You Can Find More Information*" and "*Incorporation of Certain Documents by Reference*." You should rely only on the information contained in or incorporated by reference into this prospectus and any prospectus supplement. Neither we nor the Selling Stockholders have authorized any dealer, salesperson or other person to provide you with different information. You should not assume that the information in this prospectus or any prospectus supplement is accurate as of any date other than the date on the front of those documents or that any document incorporated by reference is accurate as of any date other than its filing date. You should not consider this prospectus to be an offer or solicitation relating to the Resale Shares in any jurisdiction in which such an offer or solicitation relating to the Resale Shares is not authorized. Furthermore, you should not consider this prospectus to be an offer or solicitation relating to the Resale Shares if the person making the offer or solicitation is not qualified to do so, or if it is unlawful for you to receive such an offer or solicitation.

We obtained the industry and market data used throughout this prospectus from our own internal estimates and research, as well as from independent market research, industry and general publications and surveys, governmental agencies, publicly available information and research, and surveys and studies conducted by third parties. Internal estimates are derived from publicly available information released by industry analysts and third-party sources, our internal research and our industry experience, and are based on assumptions made by us based on such data and our knowledge of our industry and market, which we believe to be reasonable. In some cases, we do not expressly refer to the sources from which these data are derived. In addition, while we believe the industry and market data included in this prospectus are reliable and based on reasonable assumptions, such data involve material risks and other uncertainties and are subject to change based on various factors, including those risks discussed in our filings incorporated herein by reference. These and other factors could cause results to differ materially from those expressed in the estimates made by the independent parties or by us.

Unless the context indicates otherwise, when we refer to "TransCode," "we," "our," "us" and the "Company" in this prospectus, we mean TransCode Therapeutics, Inc., unless otherwise specified. When we refer to "you," we mean the potential purchasers of the Resale Shares.

Reverse Stock Split

On December 4, 2024, we effected a 1-for-33 reverse stock split of our outstanding common stock, shares either issued and outstanding or held by the Company as treasury stock (the "December 2024 Reverse Split"). The December 2024 Reverse Split did not change the number of authorized shares of common stock.

All common stock share and per share data, and exercise price data for applicable common stock equivalents, included in this prospectus, except those in our financial statements and documents incorporated by reference dated prior to the December 2024 Reverse Split, have been retroactively adjusted to reflect the December 2024 Reverse Split. Any fractional shares resulting from the December 2024 Reverse Split have been rounded up to the nearest whole share.

Corporate Information

We were incorporated in the State of Delaware in January 2016. Our corporate address is 6 Liberty Square, #2382, Boston, Massachusetts 02109; our telephone number is (857) 837-3099. Our website is www.transcodetherapeutics.com. Information contained in, or that can be accessed through, our website is not incorporated by reference into this prospectus, and you should not consider information on our website to be part of this prospectus. Our design logo and our other registered and common law trade names, trademarks and service marks are the property of TransCode.

Forward-Looking Statements

This prospectus, including the documents that we incorporate by reference, contains predictive or "forward-looking statements" within the meaning of the Private Securities Litigation Reform Act of 1995. All statements other than statements of current or historical fact contained in this prospectus, including statements that express our intentions, plans, objectives, beliefs, expectations, strategies, predictions or any other statements relating to our future activities or other future events or conditions are forward-looking statements. The words "anticipate," "believe," "continue," "could," "estimate," "expect," "intend," "may," "plan," "predict," "project," "will," "should," "would" and similar expressions, as they relate to us, are intended to identify forward-looking statements.

These statements are based on current expectations, estimates and projections made by management about our business, our industry and other conditions affecting our financial condition, results of operations or business prospects. These statements are not guarantees of future performance and involve risks, uncertainties and assumptions that are difficult to predict. Therefore, actual outcomes and results may differ materially from what is expressed or forecasted in, or implied by, the forward-looking statements due to numerous risks and uncertainties. Factors that could cause such outcomes and results to differ include, but are not limited to, risks and uncertainties arising from:

- our cash position, our estimates and expectations regarding our capital requirements, cash and expense levels, liquidity sources, our need for additional financing and our ability to obtain, on satisfactory terms or at all, the financing required to support operations, research, development, clinical trials, and commercialization of products;
- a potential delisting of our common stock from trading on the Nasdaq Capital Market;
- our ability to continue as a going concern;
- the results and timing of our preclinical and clinical trial activities, including but not limited to our ability to enroll a sufficient number of patients timely to advance our clinical trials;
- our ability to expand our therapeutic candidate portfolio through internal research and development or the acquisition or in-licensing of intellectual property assets;
- the therapeutic benefits, effectiveness and safety of our therapeutic candidates;
- our ability to receive regulatory approval for our therapeutic candidates in the United States, Europe and other geographies;
- the expected regulatory approval pathway for our therapeutic candidates;
- potential changes in regulatory requirements, and delays or negative outcomes from the regulatory approval process;
- our reliance on third parties for the planning, conduct, management and monitoring of clinical trials, for the manufacture of clinical drug supplies and drug product meeting our specifications, and for other requirements;
- our estimates of the size and characteristics of the markets that may be addressed by our therapeutic candidates;
- market acceptance of our therapeutic candidates that are approved for marketing in the United States or other countries;
- our ability to successfully commercialize our therapeutic candidates, if approved for marketing;
- the safety and efficacy of therapeutics marketed by our competitors that are targeted to indications which our therapeutic candidates have been developed to treat;
- our ability to utilize our proprietary technological approach to develop and commercialize our therapeutic candidates;
- our heavy dependence on licensed intellectual property, including our ability to source and maintain licenses from third-party owners;

Forward-Looking Statements

- our ability to protect our own or in-licensed intellectual property and operate our business without infringing the intellectual property rights of others;
- our ability to attract, retain and motivate key personnel;
- our ability to generate revenue and become profitable;
- the impact of natural disasters, global pandemics (including further outbreaks of existing strains of COVID-19 or new variants of the virus), armed conflicts and wars, labor disputes, lack of raw materials or other supplies, issues with facilities and equipment, or other forms of disruption to business operations at our manufacturing or laboratory facilities or those of our vendors;
- potential collaborations to license and commercialize any therapeutic candidates which receive regulatory approval in the future in or outside of the United States; and
- other risks and uncertainties, including those listed under the caption "Risk Factors" in our Annual Report on Form 10-K, our Quarterly Reports on Form 10-Q, and in our other regulatory filings.

You should read this prospectus and the documents that we reference herein completely and with the understanding that our actual future results may be materially different from what we currently expect. You should assume that the information appearing in this prospectus and any document incorporated by reference is accurate as of its date only. Because the risk factors referred to above could cause actual results or outcomes to differ materially from those expressed in any forward-looking statements made by us or on our behalf, you should not place undue reliance on any forward-looking statements. Further, any forward-looking statement speaks only as of the date on which it is made, and we undertake no obligation to update any forward-looking statement to reflect events or circumstances after the date on which the statement is made or to reflect the occurrence of unanticipated events. New factors emerge from time to time, and it is not possible for us to predict which factors will arise. In addition, we cannot assess the impact of each factor on our business or the extent to which any factor, or combination of factors, may cause actual results to differ materially from those contained in any forward-looking statements. We qualify all of the information presented in this prospectus, any accompanying prospectus supplement and any document incorporated herein by reference, and particularly our forward-looking statements, by these cautionary statements.

Summary

This summary highlights information contained elsewhere in this prospectus. This summary provides an overview of selected information and does not contain all of the information you should consider before investing in our securities. You should read the entire prospectus carefully, especially the "Risk Factors," as well as "Management's Discussion and Analysis of Financial Condition and Results of Operations" and our financial statements, including the accompanying notes to those statements, incorporated herein by reference to our Form 10-K, our Quarterly Report on Form 10-Q filed with the SEC on November 14, 2024, and our other filings with the SEC before making an investment decision. If any of the risks materialize or other events or conditions arise that we cannot predict, our business, financial condition, operating results and prospects could be materially and adversely affected. As a result, the price of our common stock could decline, and you could lose part or all of your investment. Some of the statements in this prospectus and the documents incorporated herein by reference constitute forward-looking statements that involve risks and uncertainties. See "Cautionary Note Regarding Forward-Looking Statements." Our actual results could differ materially from those anticipated in such forward-looking statements as a result of certain factors, including those discussed in "Risk Factors" and other sections of this prospectus and the documents incorporated herein by reference.

Overview

TransCode is clinical stage company with a platform delivery technology focused on oncology. TransCode was created on the belief that cancer can be defeated through the intelligent design and effective delivery of targeted therapeutics. Our lead therapeutic candidate, TTX-MC138 is currently being evaluated in a Phase I/II clinical study. TTX-MC138 targets microRNA-10b, or miRNA-10b, a master regulator of metastatic cell viability in a range of cancers, including breast, pancreatic, ovarian, colon cancer, glioblastomas, and several others. Metastatic disease is responsible for approximately 90% of cancer deaths and is the primary determinant in the life-limiting aspect of cancer. One validated driver of metastasis is miRNA-10b, a non-coding RNA associated with metastatic progression in numerous preclinical and more than 100 clinical studies. TransCode has developed a novel therapeutic agent (termed MN-anti-miR10b and being developed as TTX-MC138) that relies on specific eradication of metastatic tumor cells. TTX-MC138 consists of antagomirs against miRNA-10b conjugated to a unique delivery platform, called TTX, which is optimized for the targeting of primary and metastatic tumor cells. TransCode's proprietary and patented technology is designed for the selective targeting of microRNA-10b in metastatic cells independent of their type or primary tumor origin. Numerous preclinical studies conducted by TransCode's scientific co-founders have shown that TTX-MC138 mediates significant miR-10b inhibition *in vivo*, eliciting a marked and durable regression of lymph node and distant metastases in mouse models of human breast cancer with no evidence of systemic toxicity. Specifically, as few as four to six weekly treatments with TTX-MC138 in combination with low dose chemotherapy led to complete regressions of detectable metastases. Of critical importance, following elimination of metastases and following discontinuation of therapy, no evidence was found to suggest recurrence over the remaining natural life span of the animals. In addition, similar studies in mouse models of pancreatic cancer were conducted with complete responses, defined as complete regression with no disease recurrence. Metastatic cancer represents a large unmet medical need; the global metastatic cancer treatment market is expected to reach $136.9 billion by 2032 (PRNewswire/ July 6, 2023 — Allied Market Research report, titled, "Metastatic Cancer Drugs Market").

On April 14, 2024, we received an Investigational New Drug (IND) "Study May Proceed" letter from the U.S. Food and Drug Administration, or FDA, to conduct a Phase I/II clinical trial. The clinical trial is an open-label, multicenter study in cancer patients with advanced solid tumors. The objectives of this trial are to evaluate TTX-MC138 safety and tolerability of escalating dose levels of TTX-MC138. The objective of the dose-escalation stage of the trial is to determine the maximum tolerated dose, or MTD, of TTX-MC138 from which we anticipate selecting a recommended Phase 2 dose, or RP2D, level. On September 17, 2024, we announced the dosing of the first subject in the Phase I/II study. On October 10, 2024, we announced completion of the first cohort of three patients in the Phase I clinical trial, and, on October 23, 2024, we announced receipt of the trial's Safety Review Committee's authorization to proceed with dosing the second patient cohort.

Our pipeline includes a solid tumor program, TTX-siPDL1, an siRNA-based modulator of programmed death-ligand 1, or PD-L1 and TTX-RIGA, a cancer-agnostic program. TTX-RIGA is an RNA-based agonist of the retinoic acid-inducible gene I, or RIG-I, targeting activation of innate immunity in the tumor microenvironment.

All our therapeutic candidates are designed to utilize our proprietary TTX delivery mechanism with the goal of significantly improving outcomes for cancer patients. Development of our pipeline candidates other than TTX-MC138 is on hold pending the availability of sufficient additional funding.

Recent Developments

Restructuring

Throughout 2024, we have continued the various actions approved by our board of directors in December 2023 designed to streamline our operations and reduce expenses. These include delaying or eliminating certain development activities and reducing headcount by laying-off four employees in December 2023 and not filling new vacancies. These actions lowered our headcount to 8 employees at September 30, 2024, as compared to 19 employees on December 31, 2022. We have narrowed our focus primarily to the continued execution of our Phase I/II clinical trial with TTX-MC138.

Phase 0 Results

On May 29, 2024, we announced new preliminary data from our 2023 Phase 0 clinical trial with radiolabeled TTX-MC138 suggesting anti-tumor activity. The new results from the patient dosed in the Phase 0 clinical trial indicate that a microdose of radiolabeled TTX-MC138 resulted in significant inhibition of the drug candidate's molecular target, miRNA-10b, in the patient's blood. Specifically, after injection, the amount of miR-10b in the patient's blood at 24 hours following dosing was approximately 66% lower than levels prior to administration of radiolabeled TTX-MC138. We believe these data support our belief that clinical development of TTX-MC138 has the potential for clinical benefit in patients with metastatic cancer. In addition, the Phase 0 clinical trial also quantified the amount of drug candidate delivered to metastatic lesions, providing further evidence that TTX-MC138 accumulated in metastatic tumors. The increase of radioactive lesion-to-blood ratios suggests that circulating TTX-MC138 is actively taken up by the cancerous tissue. Overall, the microdose of radiolabeled TTX-MC138 was well tolerated with no adverse events observed.

Phase 1 Clinical Trial

Our Phase I/II clinical trial with our lead therapeutic candidate, TTX-MC138, is a multicenter, open-label, dose-escalation and dose-expansion study in patients with advanced solid tumors. We commenced the trial in the third quarter 2024 at MD Anderson Cancer Center and three other clinical trial sites. The first stage of this trial, the Phase 1a, calls for administration of increasing therapeutic dose levels of our drug candidate in an adaptive design to as many as six cohorts of a small number of patients per cohort. The first cohort is receiving the lowest therapeutic dose level. In October 2024, after assessing results from the initial dosing of the patients in the first cohort of the trial, the trial's Safety Review Committee, or SRC, approved commencing dosing of patients in the second cohort. Patients in the second cohort are receiving a dose that is double the level received by patients in the first cohort. After 28 days following their initial dosing, the SRC will assess results from patients in the second cohort to determine if there were any adverse effects or dose limiting toxicities. If none are reported, we anticipate receiving approval to commence dosing the third cohort at a dosage that is double that administered in the second cohort.

November 2024 Financing

On November 26, 2024, we signed stock purchase agreements with certain investors in a private placement of our securities. The offering price per unit was $0.377, for gross proceeds of approximately $8,000,000,

before deducting placement agent fees and other offering expenses. The offering was made pursuant to an exemption from registration of the securities.

NIH SBIR Award

In September 2024, we received our second NIH Award, or the 2024 Award, a Direct to Phase II SBIR Award, from the National Cancer Institute of the NIH. The 2024 Award is to support IND-enabling and clinical trial activities in our Phase1a clinical trial with our lead candidate, TTX-MC138, over two years. The total Award is for $1,999,972 of which $1,011,207 applies to the first year and $988,765 applies to the second year.

Oncotarget Publication

In September 2024, we reported the August 26, 2024, publication of an article in the journal *Oncotarget* titled, *Inhibition of miR-10b treats metastatic breast cancer by targeting stem cell-like properties* conducted in collaboration with Michigan State University. The study was led by Dr. Anna Moore, Professor, Director of the Precision Health Program, and Associate Dean of the School of Medicine at Michigan State University and our scientific co-founder. In this study, the authors show that stem-like breast cancer cells increase expression of miR-10b, the molecule targeted by TTX-MC138. The study also demonstrates that treatment of breast cancer cells with TTX-MC138 reduces their stemness, confirming that these properties make metastatic cells susceptible to the therapeutic candidate's actions. Cancer cell stemness, or capacity for self-renewal, is a critical component of metastasis, since specialized cancer stem cells are those cells uniquely capable of creating new tumors and seeding metastatic dissemination. Stemness is a property of a distinct population of cancer cells that possess developmental plasticity allowing them to self-renew and adapt to new microenvironments found at the metastatic organ where they lead to creation of metastatic tumors.

Potential Nasdaq Delisting

In the third quarter 2024, we received three letters from the staff of the Nasdaq Stock Market ("Nasdaq") notifying us that we were not in compliance with Nasdaq Listing Rules 5550(a)(2) (the "Bid Price Rule"); 5550(b)(1) (the "Equity Rule") or any of the alternative requirements in Listing Rule 5550(b); and 5635(d) (the "Shareholder Approval Rule"). As a result, shares of our common stock are subject to delisting from trading on The Nasdaq Capital Market. On October 1, 2024, we appealed the Staff's determination to a Nasdaq Hearings Panel (the "Panel"). On November 4, 2024, we were notified that the Panel granted us an extension until December 31, 2024, to regain compliance with the Nasdaq Listing Rules.

In order to regain compliance with the Nasdaq Listing Rules, we must, (i) on or before November 22, 2024, obtain shareholder approval for a reverse stock split in a ratio sufficient to regain compliance with the Bid Price Rule (we obtained this approval on November 22, 2024); (ii) on or before November 22, 2024, obtain shareholder ratification of the equity offering we completed in July 2024 (the "July Offering") (we obtained this approval on November 22, 2024); (iii) on or before December 31, 2024, demonstrate compliance with the Bid Price Rule; (iv) on or before December 31, 2024, have filed a public disclosure describing the transactions we undertook to achieve compliance and demonstrate long-term compliance with the Equity Rule and provide an indication of our equity following those transactions; and (v) on or before December 31, 2024, have provided the Panel with income projections for the next twelve months, with all underlying assumptions clearly stated and evidence of compliance with all other applicable criteria for continued listing on the Nasdaq Capital Market.

As of December 6, 2024, we believe we have fulfilled the NASDAQ requirements listed in (i) and (ii) above, and are diligently working on timely fulfilling all remaining requirements. However, there is no assurance that we will successfully regain compliance with Nasdaq Listing Rules.

In the event of a delisting from the Nasdaq Capital Market, we may seek to have our stock traded in the over-the-counter inter-dealer quotation system, more commonly known as the OTC. OTC transactions involve risks in addition to those associated with transactions in securities traded on the securities exchanges, such as

the Nasdaq Capital Market, or, together, Exchange-listed stocks. Many OTC stocks trade less frequently and in smaller volumes than Exchange-listed stocks. Accordingly, our stock would be less liquid than it would be otherwise. Also, the prices of OTC stocks are often more volatile than Exchange-listed stocks. Additionally, institutional investors are usually prohibited from investing in OTC stocks, and it might be more challenging to raise capital. In light of our financial position and our need to raise additional capital, delisting of our common stock from the Nasdaq Capital Market would materially limit our ability to obtain additional equity capital. We may need to seek an in-court or out-of-court restructuring of our liabilities. In the event of such restructuring activities, holders of our common stock and other securities will likely suffer a total loss of their investment.

Reverse Stock Split

On December 4, 2024, we effected a 1-for-33 reverse stock split of our outstanding common stock, shares either issued and outstanding or shares we hold as treasury stock. The December 2024 Reverse Split did not change the number of authorized shares of common stock.

All common stock share and per share data, and exercise price data for applicable common stock equivalents, included in this prospectus, except those in our financial statements and documents incorporated by reference dated prior to the December 2024 Reverse Split, have been retroactively adjusted to reflect the December 2024 Reverse Split. Any fractional shares resulting from the December 2024 Reverse Split have been rounded up to the nearest whole share.

Targeted Therapeutic Delivery Background

For decades, ribonucleic acid, or RNA, has been a topic of investigation by the scientific community as a potentially attractive therapeutic modality because it can target any gene and it lends itself to rational and straightforward drug design. RNA-based therapeutics are highly selective to their targets, potentially applicable to a broad array of previously undruggable targets in the human genome. We believe that one of the major challenges to widespread use of RNA therapeutics in oncology and other indications has been the inability to deliver these molecules inside cells other than in the liver.

We believe that our proprietary TTX delivery platform has the potential to resolve these key challenges. We believe overcoming the challenges of delivery would represent an important step in unlocking therapeutic access to a variety of documented targets involved in a range of cancers and other diseases.

TransCode has created a design engine to customize the development of targeted therapeutics that is modular, both at the levels of the core nanoparticle and therapeutic loading. The size, charge, and surface chemistry of the core iron oxide nanoparticle is designed so that it can be tuned to optimize the particles for the intended target and therapeutic load. The therapeutic load is designed to consist of synthetic oligonucleotides and other molecular moieties that can be adapted to the specific approach being developed. The approach can range from RNA interference, or RNAi, including small interfering RNAs, antisense oligonucleotides, and Pattern Recognition Receptor agonists such as RIG-I. While we have explored approaches to delivery of CRISPR and mRNAs using TTX, we have not yet established feasibility. We believe the platform can further be used for developing targeted radiolabeled therapeutics and diagnostics and other custom products targeting known and novel biomarkers and other genetic elements as they are discovered and validated.

The TTX platform is designed to overcome extracellular and intracellular delivery issues of stability, efficiency, and immunogenicity faced by existing lipid and liposomal nanoparticle platforms while optimizing targeting of and accumulation in tumors and metastases. We believe the ability to deliver targeted therapeutics inside tumors and metastases will potentially allow us to target genes and other important biomarkers for cancer treatment that have until now remained undruggable using other delivery systems.

Potential Near-term Milestones

We have enrolled patients in our second cohort in our Phase I/II clinical trial and are awaiting the Safety Review Committee's assessment to determine if we may begin dosing patients in the third cohort. Our outsourced drug manufacturing partner completed the manufacture of a GMP drug product batch for the ongoing Phase I clinical trial.

Subject to available capital, we plan to complete the stage 1a portion of our Phase I/II clinical trial upon meeting the required adaptive study design approved by the FDA, anticipated to be not later than the second quarter of 2026.

Complete the final clinical trial report for our Phase 0 clinical trial.

We have ongoing discussions with strategic partners involving a variety of our therapeutic candidates and hope to complete a partnering agreement with respect to one or more therapeutic candidates as soon as practical. We currently have no firm commitments from any strategic partners and there is no assurance that any partnering transactions will be effected.

If capital is available, we may advance development of one or more of our preclinical assets, including manufacturing activities to support IND enabling studies. If commenced, these activities would involve approximately two years as the drug candidate(s) would represent new molecular entities.

We previously obtained FDA Orphan Drug Designation and may file for European Orphan Drug Designation for TTX-MC138 in pancreatic cancer.

Delivery System

The therapeutic potential of RNA in oncology has remained an unrealized promise due in large part, we believe, to the difficulty in safely and effectively delivering oligonucleotides, i.e., synthetic RNA molecules, to tumors. We believe we are now closer to solving this challenge by means of our TTX platform. Our TTX platform leverages an iron-oxide nanoparticle, or IONP, approved for clinical use as a cancer imaging agent and in treating iron deficiency anemia, as the physical carrier.

The TTX technology has gone through approximately 20 years of research and development, or R&D, and optimization, including 12 years at Harvard Medical School and the Massachusetts General Hospital, by our scientific co-founders prior to company formation.

Our TTX nanocarrier is designed to be tunable to pre-designed specifications to deliver therapeutic oligonucleotides to RNA targets in tumors and metastases without compromising the integrity of the oligonucleotide. We believe TTX nanocarriers differentiate us from competitive delivery approaches, many of which rely on lipid particles or chemical structures, such as GalNAc. These competitive delivery approaches effectively target sites in the liver but not sites in tumors and metastases elsewhere. Our delivery technology could allow us to participate in additional rapidly growing global marketplaces.

Our TTX delivery platform is specifically designed to minimize early kidney and liver clearance, translating into a long circulation half-life that allows for efficient accumulation in tumors and metastases. Nanoparticles similar in formulation to ours have an excellent clinical safety record of low toxicity and immunogenicity, and their built-in imaging capabilities due to their iron core which is magnetic and visible with magnetic resonance imaging, or MRI, have the additional benefit of enabling quantification of the particles' delivery to target organs. The nanoparticles may be functionalized with amino or other functional groups to provide stable links to the therapeutic oligonucleotides of interest through covalent bonds. The TTX chemistry can be modified with various coatings to stabilize the nanoparticles, protect the cargo from degradation, promote tumor uptake and entrapment of the drug candidate inside tumor cells, and

allow control over drug pharmacokinetics. The nanoparticle used with our lead candidate, TTX-MC138, is coated with dextran, a glucose polymer, to protect the oligonucleotides from degradation and to provide overall stability to the particle.

The small hydrodynamic size and the charge of the resulting nanoparticles are designed to maximize distribution throughout the tumor microvasculature, extravasation into the interstitium of tumors and metastases, and uptake by tumors. The physicochemical properties of the nanoparticles are expected to further facilitate their rapid uptake by tumors by exploiting the high metabolic activity of cancer cells, a process analogous to the mechanism behind the systemic loading of metastatic cancer cells with fluorodeoxyglucose for diagnostic Positron Emission Tomography. We believe the combined result of a hydrodynamically-favored distribution and a metabolically-triggered uptake will result in the enhanced ability of our nanoparticles to access genetic targets inside tumors.

Advancing new RNA therapies through a modular approach

The TransCode TTX platform is modular by design, both at the level of the core nanoparticle and at the therapeutic loading. The size, charge, and surface chemistry of the core nanoparticles can be tuned to optimize them for the intended target and therapeutic load. Also, the therapeutic load can be adapted to the specific approach being developed, ranging from RNA interference, or RNAi, which includes small interfering RNAs, or siRNAs, antisense oligonucleotides, as well as Pattern Recognition Receptor agonists such as retinoic acid inducible gene, or RIG-I. In addition to nucleic acids, the TTX platform could be used to also deliver proteins, peptides, radionuclides and small molecules.

Additionally, we are interested in pursuing diagnostic approaches for RNA targets that might be relevant and important to informing treatment of patients using RNA therapeutics. Our 2018 license with MGH includes a patented microRNA screening assay with the potential to detect expression of microRNAs in patient blood. Depending on available capital, we may seek to optimize this diagnostic test to detect miR-10b in cancer patients as our first commercial testing product. If approved, this test could be used as a screening assay to detect metastasis in a variety of tumor types. Also, we believe we may be able to use this test to evaluate miR-10b expression before, during and after treatment to best determine timing of therapeutic intervention.

In September 2021, research conducted by MGH was published in Cancer Nanotechnology, entitled “Radiolabeling and PET-MRI microdosing of the experimental cancer therapeutic, MN-anti-miR10b, demonstrates delivery to metastatic lesions in a murine model of metastatic breast cancer.” This paper reported on an MGH study using a radiolabeled derivative of TTX-MC138 (referred to in the paper as MN-anti-miR10b). In this study, TTX-MC138 was tagged with copper-64, or Cu-64. As a result, highly sensitive and specific quantitative determination of pharmacokinetics and biodistribution, as well as observation of delivery of the Cu-64 labeled TTX-MC138 to metastases, was made in laboratory tests using noninvasive positron emission tomography-magnetic resonance imaging, or PET-MRI. The key results of the study suggest that TTX-MC138, when injected intravenously, accumulates in metastatic lesions. These results suggest that our TTX platform delivers its therapeutic candidate as intended and supports clinical evaluation of TTX-MC138. In addition, the MGH investigation describes a microdosing PET-MRI approach to measure TTX-MC138 biodistribution in cancer patients and its delivery to clinical metastases. (Microdoses are minute, subpharmacologic doses of a test compound, not greater than 100 micrograms.) The capacity to carry out microdosing PET-MRI studies in patients under an exploratory IND, or eIND, application could be important because it has the potential to facilitate FDA authorization of additional human studies. This research, published by Dr. Zdravka Medarova, our Chief Technology Officer and scientific co-founder, and others describes what we believe is an effective approach to assessing delivery of TTX-MC138 in metastatic cancer patients. Since the PET-MRI technique is sensitive enough to determine the concentration of radiolabeled drug candidate in the sub-picomolar range, microgram quantities of the radiolabeled drug candidate are believed to be sufficient to perform such a study in humans. We believe this capability has significant advantages in the initial phases of drug development. Because the low mass of the radiolabeled drug candidate does not induce reactions in humans, we believe the regulatory process is less complex.

Dr. Medarova's paper suggests that the radiolabeling does not impact tumor cell uptake or the ability of TTX-MC138 to engage its target. The paper also shows that the biodistribution of Cu-64 labeled TTX-MC138, when injected at a microdose, reflects its biodistribution at the level of a therapeutic dose.

These key findings informed our microdosing clinical trial with TTX-MC138. We believed that our microdosing trial had numerous advantages:

(i) allowing more precise quantitation of the amount of TTX-MC138 delivered to the metastatic lesions because of the higher sensitivity and quantitative accuracy of positron emission tomography;

(ii) permitting measurement of the pharmacokinetics and biodistribution of TTX-MC138 not only in the metastatic lesions but in other tissues throughout the body. This knowledge can inform Phase I/II clinical trial designs by allowing us to determine drug candidate uptake and clearance from vital organs;

(iii) enabling measurement of pharmacokinetic endpoints potentially informing dosing for Phase II/III clinical trials. Specifically, because of the high sensitivity and quantitative nature of PET-MRI, it may be possible to derive a more precise calculation of drug concentration in the metastatic lesions over time and then correlate that information to the effective dose defined in our preclinical studies; and

(iv) further informing selection of indications for Phase II/III trials by allowing trial design based on which patients' metastases demonstrated accumulation of TTX-MC138 in prior trials.

Because of the benefits we believe derived from a microdosing Phase 0 trial, and reflecting the studies described in Cancer Nanotechnology, we pursued a microdosing Phase 0 trial for our First-in-Human clinical trial conducted at MGH.

We believe that results from the Phase 0 trial also validated delivery generally for our TTX pipeline which potentially opens-up additional relevant RNA targets that have been previously undruggable.

In the Phase 0 trial, we administered a single microdose of radiolabeled TTX-MC138 to the trial patient, with delivery of TTX-MC138 to metastatic lesions and other tissues evaluated by PET-MRI.

Our Lead Therapeutic Candidate

Our scientific co-founders developed our lead therapeutic candidate while at The General Hospital Corporation, d/b/a Massachusetts General Hospital, to target microRNA-10b, a well-validated biomarker linked to metastatic cancer. In contrast, most anti-cancer therapies target primary tumors and do not address metastatic disease specifically. MicroRNA-10b has been shown to be the master regulator of metastatic disease in multiple tumor types. We believe effective therapeutics have not been developed targeting microRNA-10b because of challenges in delivering therapeutics to tumors despite microRNA-10b's strong association with cancer metastasis as documented in over 700 peer-reviewed scientific publications.

TTX-MC138 comprises proprietary iron-oxide nanoparticles conjugated to sequence-specific LNA/DNA oligonucleotides that target microRNA-10b. The nanoparticles serve as a vehicle to deliver oligonucleotides to tumors and metastases. The magnetic properties of these nanoparticles allow for monitoring their delivery using non-invasive imaging, which we believe adds value for clinical implementation of this therapeutic approach.

Preclinical Study Results — Breast Cancer

Our scientific co-founders conducted a variety of preclinical animal studies involving human metastatic breast cancer models. In these studies, TTX-MC138 was successfully delivered to metastatic lesions in the lymph nodes, lungs, and bones as shown by non-invasive imaging performed 24 hours after injection. In five

separate studies involving over 125 mice, TTX-MC138 was injected into mice implanted with human metastatic breast tumors. These mouse models included the rodent 4T1-luc2 orthotopic allograft, which is a very aggressive model of stage IV metastatic breast cancer, the human MDA-MB-231-luc-D3H2LN xenograft, which is a stage II/III cancer model, and the human MDA-MB-231-BrM2-831 xenograft, which is a model of breast cancer metastatic to the brain. Tumors in mice implanted with MDA-MB-231 cells typically progress from localized disease to lymph node metastases within 21 days of implantation. Tumors in mice implanted with 4T1-luc2 cells typically progress to distant sites in the animals within 10 days of implantation.

To test TTX-MC138 in the model of lymph node metastatic breast cancer, mice had their primary tumors surgically removed four to five weeks after tumor inoculation, following confirmation of lymph node metastases via imaging. This was done to better simulate a clinical scenario, since the current standard of care involves surgical removal of the primary tumor in patients with lymph node metastatic breast cancer. Treatment with TTX-MC138 was then initiated during the week of tumor removal. Because tumors in mice replicate more rapidly than is typical in humans, we combined low-dose doxorubicin with the TTX-MC138 because doxorubicin slows metastatic cell replication specific to these tumor models. Doing so allowed the TTX-MC138 to more efficiently reach and inhibit the miR-10b inside the tumor cells.

After four weeks of therapy, metastases in mice treated with TTX-MC138 regressed. By contrast, in the control groups, there was metastatic progression (Within-Subjects ANOVA: $p < 0.05$). Treatment was discontinued once complete metastatic regression was observed. By the end of the study at 12 weeks, there was no recurrence and 100% survival in treated subjects having this cancer model. In similar studies involving mice implanted with 4T1-luc2 breast tumors, we observed regression of distant metastases by week six, at which point treatment was stopped (Within-Subjects ANOVA: $p < 0.05$). Despite stopping treatment, the animals remained metastasis-free and by the end of the study, no recurrence of disease had been observed. There was evidence of complete regression without recurrence in 65% of treated subjects while 35% progressed due to insufficient inhibition of miR-10b in this group. We believe this was due to the high rate of tumor cell replication in this model resulting in dilution of the therapeutic. We do not expect this to be the case in humans with metastatic disease, in whom tumor cell replication is dramatically slower than in mice.

Preclinical Study Results — Pancreatic Cancer

We evaluated the efficacy of TTX-MC138 as monotherapy in a murine model of pancreatic adenocarcinoma and achieved positive preclinical results. In this study, we treated mice bearing human pancreatic tumors with TTX-MC138 once weekly for eight weeks. The drug candidate demonstrated a pharmacodynamic response by successfully inhibiting miR-10b. Serum miR-10b was down-regulated by TTX-MC138 and was shown to be a potential surrogate biomarker of therapeutic efficacy, opening up the possibility of noninvasive monitoring of therapeutic response in human patients. Forty percent (40%) of animals treated with TTX-MC138 had complete responses, defined as complete regression of disease and long-term survival without recurrence.

These new findings expand the potential therapeutic relevance of TTX-MC138 beyond breast cancer, in which activity had previously been shown in preclinical studies, to include pancreatic adenocarcinoma. However, there is no assurance that these preclinical results will be duplicated in further preclinical studies or in cancer patients suffering from pancreatic cancer.

Preclinical Study Results — Glioblastoma

Studies have shown that miR-10b is highly expressed in high-grade glioblastoma multiforme, or GBM, and its inhibition leads to dysregulation of multiple pathways in tumorigenesis, resulting in repression of tumor growth and increased apoptosis. Thus, we hypothesized that suppressing miR-10b could enhance the cytotoxicity of conventional GBM chemotherapy with temozolomide, or TMZ. Inhibition of miR-10b in glioblastoma cells was achieved using MN-anti-miR10b (a TTX-MC138 analogue). Treatment of U251

and LN229 human glioblastoma cells with our drug candidate led to inhibition of miR-10b accompanied by repression of growth and increase in apoptosis. We next explored whether MN-anti-miR10b could enhance the cytotoxic effect of TMZ. During these studies, we unexpectedly found that TMZ monotherapy increased miR-10b expression and changed the expression of corresponding miR-10b targets. This discovery led to the design of a sequence-dependent combination treatment, in which miR-10b inhibition and induction of apoptosis by MN-anti-miR10b was followed by a sub-therapeutic dose of TMZ, which caused cell cycle arrest and ultimately tumor cell death. Additionally, studies in human patient-derived models of GBM confirmed delivery to the brain tumors and exhibited a highly significant level of target inhibition, indicating robust pharmacodynamic activity.

Ongoing and Planned Clinical Trials

In 2023, we conducted a First-in-Human, or FIH, clinical trial with TTX-MC138-NODAGA-Cu64 (a radiolabeled version of TTX-MC138). This clinical trial involved administering a single microdose of TTX-MC138-NODAGA-Cu64 into cancer patients with advanced solid tumors. Dosing was followed by imaging using integrated positron emission tomography-magnetic resonance imaging, or PET-MRI. The Phase 0 trial was intended to quantify the amount of radiolabeled TTX-MC138 delivered to metastatic lesions and the pharmacokinetics (PK) and biodistribution of the therapeutic candidate in cancer patients. The single microdose design of the Phase 0 trial was not expected to demonstrate target engagement. The Phase 0 trial yielded critical data regarding therapeutic dose, timing, and potential safety that may inform later clinical trials. We believe that demonstrating our ability to overcome the challenge of RNA delivery to genetic targets, and specifically to tumors and metastases, represents a major step forward in unlocking therapeutic access to genetic targets involved in a range of cancers. We announced preliminary Phase 0 data in the fourth quarter 2023, and additional results in May 2024. In the third quarter 2024, we commenced our Phase I/II clinical trial. Our Phase I/II clinical trial is an open-label, multicenter dose escalation and dose expansion study to evaluate TTX-MC138 safety and tolerability of escalating dose levels of TTX-MC138. The objective of the dose-escalation stage of the trial is to determine the maximum tolerated dose, or MTD, from which we anticipate, determining a recommended Phase II dose, or RP2D. On September 17, 2024, we announced dosing of the first patient in the Phase I/II clinical trial. On October 10, 2024, we announced completion of the initial dosing of the first patients in this trial (designated as cohort 1) and, on October 23, 2024, we announced Safety Review Committee authorization to proceed with dosing patients comprising cohort 2.

Modular Design Toolbox

We employ a design engine to enable development of RNA therapeutic candidates that we believe can be efficiently delivered to genetic targets inside tumor cells. This approach is based on four complementary elements that together address the challenges of RNA drug development in oncology:

Nanocarrier Delivery Mechanism — Our strategy seeks to leverage a nanoparticle that has been extensively used in humans for imaging by repurposing it to deliver targeted therapeutics to oncology targets and for other therapeutic applications. The nanocarrier is tunable to pre-designed specifications to deliver therapeutic oligonucleotides to an RNA target in tumors and metastases without compromising its integrity. These nanocarriers differentiate us from competitive delivery approaches, many of which rely on lipid nanoparticles or chemical structures, such as GalNAc. Competitive delivery approaches effectively target sites in the liver but not sites in tumors and metastases elsewhere.

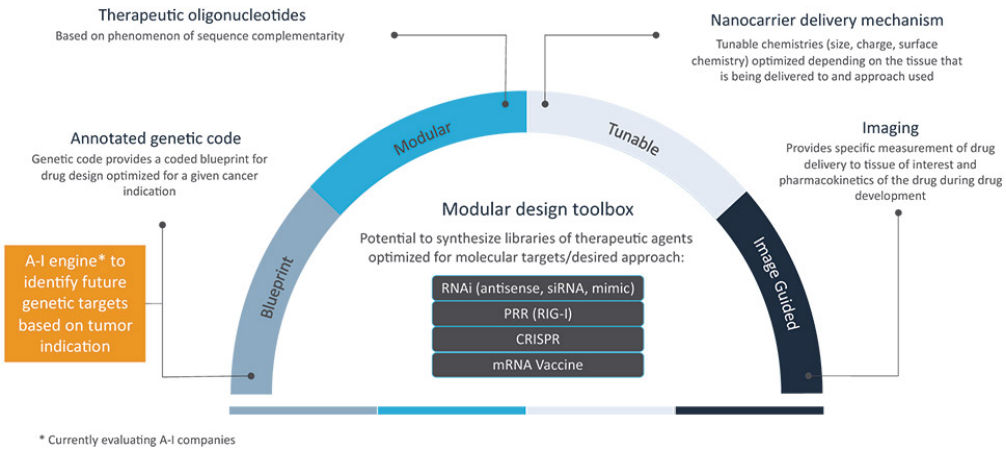
We expect that our competitive advantages will include effectively reaching tumors and metastases, achieving robust target engagement in tumor cells, which may result in a wide therapeutic window .

Genetic Code — Our approach to drug development takes advantage of our rapidly expanding knowledge about the human genome and the annotation of the genome — the knowledge about what different genes are responsible for, especially in cancer. Armed with this knowledge, we can take advantage of the coded

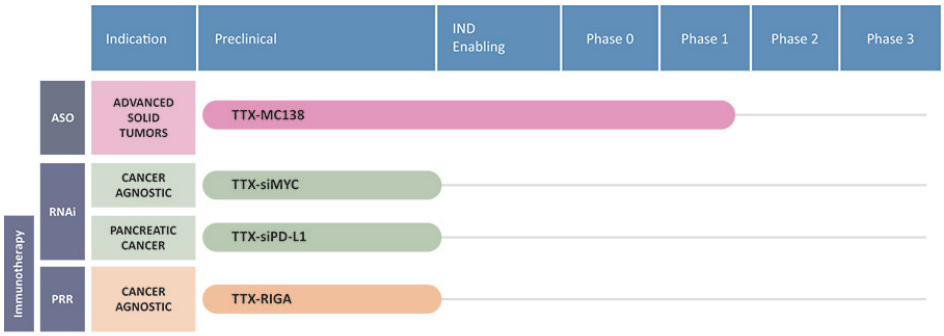
nature of the genome to design therapeutic or diagnostic agents. Specifically, once we determine the code of the cancer target, we can develop therapeutic candidates using specific nucleic acids that are harmonized to that target and potentially rewrite the story on cancer. This is what TransCode means — to change the code. After determining the genetic target of interest, we may be able to choose from a variety of RNA approaches best suited for that target. Those approaches will likely range from RNAi, which include siRNAs, antisense oligonucleotides, and non-coding RNA mimics, or Pattern Recognition Receptor agonists like RIG-I.

Modular Design for Therapeutic Development — Our discovery platform consists of a modular 'toolbox' for developing therapeutic candidates designed to attack specific disease-causing RNA targets based on the phenomenon of genetic complementarity. These therapeutic candidates incorporate synthetic oligonucleotides, or oligos, that can be designed as antagomirs, mimics, miRNA sponges, siRNA duplexes, ribozymes, and others depending on the desired therapeutic strategy. In addition to the varied oligo design approach, we can also synthesize nanocarriers with tunable chemistry properties to enable delivery of proteins, peptides, radionuclides and small molecules. Combined, the modularity and tunability of these oligonucleotides and nanocarrier components may enable the potential to synthesize libraries of therapeutic agents designed for a given indication or a given patient in terms of therapeutic oligonucleotide design, size, surface coating and charge, hydrophilicity and hydrophobicity, and antigen-targeting through incorporation of targeting peptides.

Image Guided — Because our therapeutic candidates are innately detectable using non-invasive imaging, we can monitor their delivery to the tissue of interest and measure their bioavailability. The ability to monitor delivery using Magnetic Resonance Imaging, or MRI, can be instrumental in assessing and controlling the amount of oligonucleotide that reaches targeted tissues. MRI use during the design phase of the therapeutic candidate could guide drug design, delivery schedule, route, and dose and could suggest alternatives should treatment with the therapeutic candidate fail in a given patient. This is critical during drug development because it should allow us to optimize drug design to maximize therapeutic effect.



Pipeline



Received orphan designation status from FDA for PDAC for TTX-MC138 and TTX-siPDL1

Summary of Risks

Our business is subject to numerous material and other risks and uncertainties that you should be aware of in evaluating our business. These risks are described more fully elsewhere in this prospectus or incorporated herein by reference, including in the section entitled "Risk Factors," and our other filings with the SEC and include, but are not limited to, the following:

- our low cash position and our estimates and expectations regarding our capital requirements, cash and expense levels, liquidity sources and our ability to obtain, on satisfactory terms or at all, the financing required to support operations, research, development, clinical trials, and commercialization of products;
- a potential delisting of our common stock from trading on the Nasdaq Capital Market because we have not met certain Nasdaq listing requirements;
- our ability to continue as a going concern;
- our business is highly dependent on the success of TTX-MC138, our lead therapeutic candidate which is at the early stages of development. Our therapeutic candidates require significant additional preclinical, clinical development and manufacturing validation before we may be able to seek regulatory approval for and launch a product commercially;
- the results from our manufacturing, preclinical and clinical trial activities;
- the therapeutic benefits, effectiveness and safety of our therapeutic candidates;
- our ability to receive regulatory approval for our therapeutic candidates in the United States, Europe and other geographies;
- the expected regulatory approval pathway for our therapeutic candidates;
- potential changes in regulatory requirements, and delays or negative outcomes from the regulatory approval process;
- our reliance on third parties for the planning, conduct and monitoring of clinical trials, for the manufacture of clinical drug supplies and drug product, and for other requirements;
- our estimates of the size and characteristics of the markets that may be addressed by our therapeutic candidates if approved;
- market acceptance of our therapeutic candidates that are approved for marketing in the United States or other countries;
- our ability to expand our therapeutic candidate portfolio through internal research and development or the acquisition or in-licensing of intellectual property assets;

- the impact of natural disasters, global pandemics (including further outbreaks of existing strains of COVID-19 or new strains of the virus), labor disputes, armed conflicts and wars, lack of raw materials or other supplies, issues with facilities and equipment or other forms of disruption to business operations at our manufacturing or laboratory facilities or those of our vendors, or at clinical trial sites;
- our ability to utilize our proprietary technological approach to develop and commercialize our therapeutic candidates;
- our heavy dependence on licensed intellectual property, including our ability to source and maintain licenses from third-party owners;
- our ability to protect our intellectual property and operate our business without infringing the intellectual property rights of others;
- our ability to attract, retain and motivate key personnel;
- our reliance on third-party manufacturers to manufacture and release our drug substance and drug product that meets with our designated specifications;
- our ability to initiate and complete our clinical trials;
- potential collaborations to license and commercialize any therapeutic candidates for which we receive regulatory approval in the future in or outside of the United States;
- clinical development involves a lengthy; complex and expensive process; with an uncertain outcome, and the results of preclinical studies, manufacturing, and early-stage clinical trials of our therapeutic candidates may not be predictive of the results of later-stage clinical trials;
- we may incur additional costs or experience delays in completing, or ultimately be unable to complete, the development, manufacturing and commercialization of TTX-MC138 or any of our other therapeutic candidates;
- our therapeutic candidates may cause undesirable side effects or death or have other properties that could halt their clinical development, prevent their regulatory approval, limit their commercial potential or result in significant negative consequences;
- if we are unable to advance our therapeutic candidates to clinical development, obtain regulatory approval and ultimately commercialize our therapeutic candidates, or if we experience significant delays in doing so, our business will be materially harmed;
- even if we receive regulatory approval of TTX-MC138 or any of our other therapeutic candidates, we will be subject to ongoing regulatory requirements and continued regulatory review, which may result in significant additional expense. We may be subject to penalties if we fail to comply with regulatory requirements or experience unanticipated problems with our therapeutic candidates;
- we expect to rely on third-parties to manufacture and supply materials we require for research and development, preclinical studies and clinical trials which could result in supplies that are limited or interrupted or which may not be of satisfactory quantity or quality or other delays or disruptions;
- ongoing healthcare legislative and regulatory reform measures may have a material adverse effect on our business and results of operations;
- we are subject to geopolitical risks, economic volatility, anti-corruption laws, export and import restrictions, local regulatory authorities and the laws and medical practices in foreign jurisdictions;
- obtaining and maintaining regulatory approval for our therapeutic candidates in one jurisdiction does not mean that we will be successful in obtaining regulatory approval for that or of any of our other therapeutic candidates in other jurisdictions;
- we face substantial competition, which may result in others discovering, developing or commercializing products before or more successfully than we do;

- the price of our common stock may be volatile and fluctuate substantially, which could result in substantial losses for purchasers of our common stock;
- we have broad discretion in the use of the net proceeds from this offering and may not use them effectively;
- investors may incur dilution in the net tangible book value of the shares purchased in the offering;
- we have identified material weaknesses in our internal control over financial reporting. If we are unable to remediate these material weaknesses, or if we identify additional material weaknesses in the future or otherwise fail to maintain an effective system of internal controls, we may not be able to accurately or timely report our financial condition or results of operations, which may adversely affect our business and the trading price of our common stock; and
- other risks and uncertainties, including those listed under the caption "Risk Factors" in our Annual Report on Form 10-K and in our other regulatory filings, including our Quarterly Report on Form 10-Q filed with the SEC on November 14, 2024.

The Offering

Issuer	TransCode Therapeutics, Inc.
Securities Offered by Selling Stockholders	(i) 173,033 shares of Common Stock issued in the PIPE; (ii) 470,007 shares of Common Stock issuable upon the exercise of the PIPE PFWs; (iii) up to 4,050,953 common shares underlying the Series C Common Warrants; and (iv) up to 12,152,856 common shares underlying the Series D Common Warrants
Terms of the Warrants	Each Series C Warrant has an initial exercise price per share of $15.675 and will be exercisable beginning on the date on which Stockholder Approval (as defined below) is received and deemed effective (the "Initial Exercise Date" or the "Stockholder Approval Date"). The Series C Warrants will expire on the five-year anniversary of the Initial Exercise Date. Additionally, the Series C Warrants provide for an adjustment to the exercise price and number of shares underlying such the Series C Warrants upon the Company's issuance of common shares or common share equivalents at a price per share that is less than the exercise price of the Series C Warrants, subject to a floor price of $2.4882 (the "Floor Price"). The Series D Warrants have an initial exercise price per share of $15.675 and will be exercisable beginning on the Initial Exercise Date. The Series D Warrants will expire two and one-half years after the Initial Exercise Date. Under an alternative cashless exchange provision in the Series D Warrants, holders thereof have the right to receive an aggregate number of shares equal to the product of (i) the aggregate number of common shares that would be issuable upon a cash exercise of the Series D Warrants and (ii) 3.0. In addition, on the 11th trading day following each of (i) the later of (A) the Stockholder Approval Date and (B) the Effective Date (as that term is defined in the PIPE SPA) and (ii) each subsequent date that a Registration Statement (as that term is defined in the PIPE SPA) is declared effective by the Securities and Exchange Commission, if any (each such trading day, a "Reset Date"), the Series C Warrants and the Series D Warrants contain a reset of the exercise price to a price equal to the lesser of (i) the then applicable exercise price and (ii) the greater of the Floor Price and the lowest volume weighted average price for the ten trading days immediately preceding the Reset Date. Upon such reset of the exercise price, the number of shares issuable under the Common Warrants shall be increased such that the aggregate exercise price of the Common Warrants shall remain unchanged following such reset. The issuance of shares of Common Stock upon exercise of the Common Warrants is subject to stockholder approval under applicable rules and regulations of The Nasdaq Stock Market LLC ("Nasdaq") ("Stockholder Approval" and the date on which Stockholder Approval is received and deemed effective, the "Stockholder Approval Date"). The Company intends to hold a shareholder meeting to obtain Stockholder Approval within 70 days following the closing of the PIPE.

Shares of Common Stock Outstanding Prior to this Offering(1)	696,249 shares of Common Stock:
Shares of Common Stock Outstanding Assuming Exercise of All PIPE PFWs(1):	1,166,256 shares of Common Stock
Terms of the Offering	The Selling Stockholders will each determine when and how they will sell the Resale Shares offered in this prospectus, as described in the "*Plan of Distribution*."
Use of Proceeds	We will not receive any proceeds from the sale by the Selling Stockholders of the Common Stock issued in the PIPE. We will, however, receive the net proceeds of any Warrants exercised for cash. See "*Use of Proceeds*."
Risk Factors	See "*Risk Factors*" incorporated by reference into this prospectus from our most current Annual Report on Form 10-K and subsequent Quarterly Reports on Form 10-Q, for a discussion of certain factors you should carefully consider before deciding to invest in our Common Stock.
Nasdaq Capital Market Symbol	RNAZ

1) The number of shares of Common Stock is based on 696,249 shares of our Common Stock outstanding as of December 4, 2024, and excludes as of that date:

- 470,007 shares of Common Stock issuable upon exercise of outstanding pre-funded warrants;
- 58,096 shares of Common Stock issuable upon the exercise of stock options with a weighted average exercise price of $83.82 per share;
- 1,656,729 shares of Common Stock issuable upon exercise of outstanding warrants with a weighted average exercise price of $30.55 per share; and
- 16,203,809 shares of Common Stock issuable upon exercise of the Series C Warrants and the Series D Warrants

Unless otherwise indicated, all information in this prospectus supplement assumes no exercise of the outstanding options or warrants described above.

Risk Factors

Investing in our Common Stock involves a high degree of risk. Our business is influenced by many factors that are difficult to predict, involve uncertainties that may materially affect actual results and are often beyond our control. You should consider carefully the risks and uncertainties under the heading "*Risk Factors*" in our Annual Report on Form 10-K for the fiscal year ended December 31, 2023 and our Quarterly Reports for the fiscal periods ended March 31, 2024, June 30, 2024, and September 30, 2024, which are each incorporated by reference in this prospectus, as well as any amendment or update to our risk factors in subsequent filings with the SEC, and other information in our financial statements and notes thereto, all of which are incorporated by reference into this prospectus, before deciding to invest in our Common Stock. If any of the described risks incorporated by reference hereto were to materialize, our business, financial condition, results of operations, and future growth prospects could be materially and adversely affected. In that event, the market price of our Common Stock could decline, and you could lose part of or all of your investment in our Common Stock. See the section of this prospectus titled "*Where You Can Find More Information*."

Risks Related to Sales by Selling Stockholders

Sales of substantial amounts of our common shares by a Selling Stockholder, or the perception that sales could occur, could adversely affect the price of our common shares.

The sale by Selling Stockholders of a significant number of common shares could have a material adverse effect on the market price of our common shares. In addition, the perception in the public markets that the Selling Stockholders may sell all or a portion of their shares as a result of the registration of such shares for resale pursuant to this prospectus could also in and of itself have a material adverse effect on the market price of our common shares. We cannot predict the effect, if any, that market sales of common shares by Selling Stockholders, or the availability of their common shares for sale, will have on the market price of our common shares.

The exercise of the Warrants, including their reset and anti-dilution features, may result in substantial dilution to purchasers of our Common Stock and may adversely affect the market price of our Common Stock.

On November 26, 2024, we entered into the PIPE SPA with the Selling Stockholders in connection with which we issued to the Selling Stockholders our Series C Warrants and Series D Warrants. Each Series C Warrant has an initial exercise price per share of $15.675 and will be exercisable beginning on the date on which Stockholder Approval (as defined below) is received and deemed effective (the "Initial Exercise Date" or the "Stockholder Approval Date"). The Series C Warrants will expire on the five-year anniversary of the Initial Exercise Date. Additionally, the Series C Warrants provide for an adjustment to the exercise price and number of shares underlying such Series C Warrants upon our issuance of common shares or common share equivalents at a price per share that is less than the exercise price of the Series C Warrants, subject to a floor price of $ 2.4882 per share (the "Floor Price"). The Series D Warrants have an initial exercise price per share of $15.675 and will be exercisable beginning on the Initial Exercise Date. Under an alternative cashless exchange provision in the Series D Warrants, holders thereof have the right to receive an aggregate number of shares equal to the product of (i) the aggregate number of common shares that would be issuable upon a cash exercise of the Series D Warrants and (ii) 3.0. In addition, on the 11th trading day following each of (i) the later of (A) the Stockholder Approval Date and (B) the Effective Date (as that term is defined in the PIPE SPA) and (ii) each subsequent date that a Registration Statement (as that term is defined in the PIPE SPA) is declared effective by the Securities and Exchange Commission, if any (each such trading day, a "Reset Date"), the Series C Warrants and the Series D Warrants contain a reset of the exercise price to a price equal to the lesser of (i) the then applicable exercise price and (ii) the greater of the Floor Price and the lowest volume weighted average price for the ten trading days immediately preceding the Reset Date. Upon such reset of the exercise price, the number of shares issuable under the Common Warrant shall be increased such that the aggregate exercise price of the Common Warrant shall remain unchanged following such reset. The issuance of shares of Common Stock upon exercise of the Common Warrants is subject to stockholder approval under applicable rules and regulations of The Nasdaq Stock

Market LLC ("Nasdaq") ("Stockholder Approval" and the date on which Stockholder Approval is received and deemed effective, the "Stockholder Approval Date"). The Company intends to hold a shareholder meeting to obtain Stockholder Approval within 70 days following the closing of the PIPE.

The reset feature in the Warrants may adjust the exercise price downward and increase the number of shares issuable upon exercise under certain conditions thereby causing further dilution to existing stockholders, including purchasers of our common stock. This additional dilution could be significant, depending on the extent of the adjustments triggered by the reset provisions and the number of warrants exercised.

The potential for increased dilution due to the reset feature may exert downward pressure on the market price of our common stock, as investors anticipate the possibility of additional shares entering the market. Moreover, the uncertainty surrounding the number of shares that ultimately may be issued upon exercise of these warrants could make our common stock less attractive to investors, potentially further depressing our stock price.

The issuance of additional shares upon exercise of the warrants with reset features could also make it more difficult for us to raise additional capital through future offerings of equity securities. Investors may be concerned about the dilutive effects of such features, which could impair our ability to secure financing on favorable terms if at all. Purchasers of our common stock may experience immediate and substantial dilution in the net tangible book value per share of their investment upon the exercise of these warrants, especially if the reset features are triggered and result in issuances of additional shares.

Use of Proceeds

We are not selling common shares for our own account under this prospectus and we will not receive any proceeds from any sales by Selling Stockholders of our common stock covered by this prospectus and any accompanying prospectus supplement. All proceeds from the sale of the common stock by the Selling Stockholders will be for their own accounts. We will, however, receive the net proceeds of any Warrants exercised for cash. Proceeds, if any, received from the exercise of such Warrants will be used for working capital and for general corporate purposes. No assurances can be given that any of such Warrants will be exercised.

Each Selling Stockholder will pay any discounts, commissions, and fees of underwriters, selling brokers, dealer managers or similar securities industry professionals incurred by such Selling Stockholder in disposing of the Resale Shares covered by this prospectus. We will bear all other costs, fees and expenses incurred in effecting the registration of the offer and sale of the Resale Shares covered by this prospectus and any accompanying prospectus supplement, including, without limitation, all registration and filing fees, Nasdaq listing fees and fees and expenses of our counsel and our accountants.

Determination of Offering Price

We cannot determine in advance the price or prices at which the shares of Common Stock may be sold by the Selling Stockholders under this prospectus.

The Selling Stockholders

The shares of Common Stock being offered by the Selling Stockholders are those previously issued to the Selling Stockholder, and those issuable to the Selling Stockholders upon exercise of the Warrants. For additional information regarding the issuances of those shares of Common Stock and Warrant Shares, see "*The Offering.*". We are registering the Resale Securities in order to permit the Selling Stockholders to offer the shares for resale from time to time. Except for the ownership of the shares of Common Stock and the Warrants, as well as their other purchases of other securities from us, if any, the Selling Stockholders have not had any material relationship with us within the past three years.

The shares offered by this prospectus may be sold from time to time on Nasdaq, in privately negotiated transactions or otherwise. We have agreed to prepare and file amendments and supplements to the registration statement to the extent necessary to keep the registration statement effective for the period of time required under our agreement with the Selling Stockholders.

All information with respect to the Selling Stockholders' ownership of the Resale Shares has been furnished by or on behalf of the Selling Stockholders and is as of December 2, 2024. The percentage ownership data is based on 696,249 shares of Common Stock issued and outstanding as of December 2, 2024. We believe, based on information supplied by the Selling Stockholders, that except as may otherwise be indicated in the table below, the Selling Stockholders and their affiliates listed in any footnote to the table below have sole voting and dispositive power with respect to the shares of Common Stock reported as beneficially owned by them.

The aggregate number of shares of Common Stock that the Selling Stockholders may offer and sell pursuant to this prospectus is based upon (i) the number of shares of Common Stock issued them in the PIPE; (ii) the number of shares of Common Stock that may be issued to the Selling Stockholders upon their exercise of PIPE PFWs; and (iii) the number of shares of Common Stock that may be issued to the Selling Stockholders upon their exercise of the Common Warrants. The Selling Stockholders may sell some, all or none of the Resale Shares. We do not know how long the Selling Stockholders will hold the Resale Shares before selling them, and we currently have no agreements, arrangements or understandings with any Selling Stockholder regarding the sale or other disposition of any of the Resale Shares or any other shares of Common Stock. The Resale Shares may be offered and sold from time to time by the Selling Stockholders pursuant to this prospectus.

The Series C Warrants and the Series D Warrants contain a reset of the exercise price to a price equal to the lesser of (i) the then applicable exercise price and (ii) the greater of the Floor Price and the lowest volume weighted average price for the ten trading days immediately preceding the Reset Date. Upon such reset of the exercise price, the number of shares issuable under the Common Warrant shall be increased such that the aggregate exercise price of the Common Warrant shall remain unchanged following such reset. Due to this anti-dilution feature, we have included in the third column in the table below the maximum number of shares of Common Stock that can be issued upon exercise of the Warrants.

Because the Selling Stockholders may sell some or all of the Resale Shares included in this prospectus, and because there are currently no agreements, arrangements or understandings with respect to the sale of any of the Resale Shares, no estimate can be given as to the number of shares of Common Stock available for resale hereby that will be held by the Selling Stockholders in the future. In addition, the Selling Stockholders may have sold, transferred or otherwise disposed of, or may sell, transfer or otherwise dispose of, at any time and from time to time, Resale Shares they hold in transactions exempt from the registration requirements of the Securities Act after the date on which they provided the information set forth in the table below. We have, therefore, assumed for the purposes of the following table, that the Selling Stockholders will sell all of the Resale Shares owned beneficially by them and their affiliates listed in any footnote to the table below that are covered by this prospectus, but not any other shares of Common Stock they may beneficially own.

Under the terms of the Warrants, a Selling Stockholder may not exercise the Warrants to the extent such exercise would cause such Selling Stockholder, together with its affiliates and attribution parties, to beneficially

own a number of common shares which would exceed 4.99% or, at their election, 9.99%, of our common shares following such exercise, excluding for purposes of such determination common shares issuable upon exercise of the Warrants which have not been exercised. The number of common shares in the fourth column below does not reflect this limitation.

	Selling Stockholder Information:				
Selling Stockholders(1)	**Common Stock Owned Immediately Prior to this Offering(2)**	**Common Stock and PFW Shares Being Offered for Resale Under this Prospectus(3)**	**Common Warrant Shares Being Offered for Resale Under this Prospectus(4)**	**Number of Shares Beneficially Owned After Sale of Common Stock PFW Shares and Warrant Shares(5)**	**Percentage of Outstanding Shares of Common Stock Beneficially Owned Immediately Following the Sale of Common Stock and Warrant Shares(6)**
2024 Selling Stockholders					
Anson East Master Fund LP(7)	—	26,526	668,424	—	—
Anson Investments Master Fund LP(8)	—	94,045	2,369,796	—	—
Bigger Capital Fund, LP(9)	—	120,570	3,038,219	—	—
District 2 Capital Fund LP(10)	8,694	80,380	2,025,479	8,694	*
L1 Capital Global Opportunities Master Fund(11)	—	120,570	3,038,219	—	—
Sabby Volatility Warrant Master Fund, Ltd.(12)	154,855	200,949	5,063,672	154,855	*
Total	163,549	643,040	16,203,809	163,549	*

* Represents less than 1%

1) The principal business address and address for notice to the Selling Stockholders is the address set forth in our books and records.

2) This includes, for each Selling Stockholder, any shares of Common Stock beneficially owned by such holder acquired in one or more transactions separate from and unrelated to the holder's ownership of any of our Common Stock.

3) This includes, for each Selling Stockholder, PIPE Common Stock shares and PIPE PFW Shares being sold hereunder.

4) This includes, for each Selling Stockholder, the maximum amount of Common Stock that can be issued upon exercise of the Warrants after factoring in the anti-dilution feature.

5) Assumes the Selling Stockholders sell all of the Resale Shares being offered by this prospectus.

6) Percentage calculated based upon the assumption that the Selling Stockholders sell all of the Resale Shares offered by this prospectus.

7) Based on information provided by Anson East Master Fund LP, Anson Advisors Inc and Anson Funds Management LP, the Co-Investment Advisers of Anson East Master Fund LP ("Anson"), hold voting and dispositive power over the securities which include 15,267 shares of Common Stock, 11,259 Pre-Funded Warrants, and 668,424 Common Warrants held by Anson. Tony Moore is the managing member of Anson Management GP LLC, which is the general partner of Anson Funds Management LP. Moez Kassam and Amin Nathoo are directors of Anson Advisors Inc. Mr. Moore, Mr. Kassam and Mr. Nathoo each disclaim beneficial ownership of these Common Shares except to the extent of their pecuniary interest therein.

8) Based on information provided by Anson Investments Master Fund LP, Anson Advisors Inc and Anson Funds Management LP, the Co-Investment Advisers of Anson Investments Master Fund LP ("Anson"), hold voting and dispositive power over the securities which include 54,127 shares of Common Stock, 39,917 Pre-Funded Warrants, and 2,369,796 Common Warrants held by Anson. Tony Moore is the managing member of Anson Management GP LLC, which is the general partner of Anson Funds Management LP. Moez Kassam and Amin Nathoo are directors of Anson Advisors Inc. Mr. Moore, Mr. Kassam and Mr. Nathoo each disclaim beneficial ownership of these Common Shares except to the extent of their pecuniary interest therein. The principal business address of Anson is Maples Corporate Services Limited, PO Box 309, Ugland House, Grand Cayman, KY1-1104, Cayman Islands.

9) Based on information provided by Bigger Capital Fund, LP, Michael Bigger is the controlling person of the securities which include 34,545 shares of Common Stock, 86,024 Pre-Funded Warrants and 3,038,219 Common Warrants held by Bigger Capital Fund, LP.

10) Based on information provided by District 2 Capital Fund LP, Michael Bigger is the controlling person of the securities which include 34,546 shares of Common Stock, 45,834 Pre-Funded Warrants, 2,025,479 Common Warrants and 8,694 warrants to purchase common stock exercisable within 60 days of December 2, 2024, held by District 2 Capital Fund LP.

11) Based on information provided by L1 Capital Global Opportunities Master Fund, David Feldman and Joel Arber are the controlling persons of the securities which include 34,546 shares of Common Stock, 86,024 Pre-Funded Warrants, and 3,038,219 Common Warrants held by L1 Capital Global Opportunities Master Fund.

12) Based on information provided by Sabby Volatility Warrant Master Fund, Ltd., Sabby Management, LLC is the investment manager of Sabby Volatility Warrant Master Fund, Ltd. and shares voting and investment power with respect to these shares in this capacity. As manager of Sabby Management, LLC, Hal Mintz also shares voting and investment power on behalf of Sabby Volatility Warrant Master Fund, Ltd. Each of Sabby Management, LLC and Hal Mintz disclaims beneficial ownership over the securities listed except to the extent of their pecuniary interest therein. Sabby Volatility Warrant Master Fund, Ltd. holds 200,949 Pre-Funded Warrants, 5,063,672 Comon Warrants and 154,855 warrants to purchase common stock exercisable within 60 days of December 2, 2024.

Relationship with the Selling Stockholders

Registration Rights Agreement

Pursuant to the PIPE SPA, we agreed to (i) prepare and file with the SEC the registration statement of which this prospectus forms a part to permit the resale of the Resale Shares and (ii) subject to certain exceptions, to use reasonable best efforts to keep such registration statement effective under the Securities Act until (x) all Resale Shares the offer and resale of which are registered by the registration statement have been sold, transferred or otherwise disposed of by the Selling Stockholders, (y) the Resale Shares are sold, transferred or otherwise disposed of pursuant to Rule 144 of the Securities Act, or (z) the Resale Shares have become eligible for sale by the Selling Stockholders pursuant to Rule 144 without any restriction on the volume or manner of such sale and all restrictive legends and stop transfer instructions have been removed with respect to all book entries representing the Resale Shares.

We have also agreed, among other things, to indemnify the Selling Stockholders and their officers, directors, members, employees and agents, successors and assigns, and any person who controls any of the Selling Stockholders (within the meaning of the Securities Act or the Exchange Act) from all losses and liabilities arising out of or relating to any untrue statement or alleged untrue statement or omission or alleged omission of material fact in this prospectus or the registration statement of which this prospectus forms a part.

PIPE Series C and Series D Warrants

On November 26, 2024, we entered into the PIPE SPA in connection with which we issued to the Selling Stockholders our Series C Warrants and Series D Warrants. Each Series C Warrant has an initial exercise price per share of $15.675 and will be exercisable beginning on the date on which Stockholder Approval (as

defined below) is received and deemed effective (the "Initial Exercise Date" or the "Stockholder Approval Date"). The Series C Warrants will expire on the five-year anniversary of the Initial Exercise Date. Additionally, the Series C Warrants provide for an adjustment to the exercise price and number of shares underlying such the Series C Warrants upon the Company's issuance of common shares or common share equivalents at a price per share that is less than the exercise price of the Series C Warrants, subject to a floor price of $2.4882 per share (the "Floor Price"). The Series D Warrants have an initial exercise price per share of $15.675 and will be exercisable beginning on the Initial Exercise Date. The Series D Warrants will expire two and one-half years after the Initial Exercise Date. Under an alternative cashless exchange provision in the Series D Warrants, holders thereof have the right to receive an aggregate number of shares equal to the product of (i) the aggregate number of common shares that would be issuable upon a cash exercise of the Series D Warrants and (ii) 3.0. In addition, on the 11th trading day following each of (i) the later of (A) the Stockholder Approval Date and (B) the Effective Date (as that term is defined in the PIPE SPA) and (ii) each subsequent date that a Registration Statement (as that term is defined in the PIPE SPA) is declared effective by the Securities and Exchange Commission, if any (each such trading day, a "Reset Date"), the Series C Warrants and the Series D Warrants contain a reset of the exercise price to a price equal to the lesser of (i) the then applicable exercise price and (ii) the greater of the Floor Price and the lowest volume weighted average price for the ten trading days immediately preceding the Reset Date. Upon such reset of the exercise price, the number of shares issuable under the Common Warrant shall be increased such that the aggregate exercise price of the Common Warrant shall remain unchanged following such reset.

The issuance of shares of Common Stock upon exercise of the Common Warrants is subject to stockholder approval under applicable rules and regulations of The Nasdaq Stock Market LLC ("Nasdaq") ("Stockholder Approval" and the date on which Stockholder Approval is received and deemed effective, the "Stockholder Approval Date"). The Company intends to hold a shareholder meeting to obtain Stockholder Approval within 70 days following the closing of the PIPE.

A holder of Resale Securities will not have the right to exercise any portion of the Common Warrants or PIPE PFWs if the holder (together with its affiliates) would beneficially own in excess of 4.99% or 9.99%, as applicable, of the number of shares of Common Stock outstanding immediately after giving effect to the exercise, as such percentage ownership is determined in accordance with the terms of the Common Warrants or the PIPE PFWs, respectively.

Description of Securities Being Registered

We are registering the resale of (i) 173,033 shares of our common stock, par value $0.0001 per share, ("Common Stock") issued in a private placement of our securities (the "PIPE"), (ii) 470,007 shares of Common Stock (the "PIPE PFW Shares") issuable upon exercise of pre-funded warrants (each, a "PIPE PFW"), (iii) up to 4,050,951 common shares underlying the Series C Common Warrants and (iv) up to 12,152,853 common shares underlying the Series D Common Warrants issued in the PIPE and issuable in connection with the Warrants.

Common Stock

The Company's Certificate of Incorporation, as amended, authorizes the Company to issue up to 290,000,000 shares of Common Stock. Our Common Stock is traded on The Nasdaq Capital Market under the symbol "RNAZ."

The terms, rights, preference and privileges of the Common Stock are as follows:

Voting Rights. Each holder of Common Stock is entitled to one vote per share of Common Stock held on all matters submitted to a vote of the stockholders, including the election of directors. The Company's certificate of incorporation and bylaws do not provide for cumulative voting rights.

Dividends. Subject to preferences that may be applicable to any then-outstanding preferred stock, the holders of the Company's outstanding shares of Common Stock are entitled to receive dividends, if any, as may be declared from time to time by the Company's Board of Directors out of legally available funds.

Liquidation. In the event of the Company's liquidation, dissolution or winding up, holders of Common Stock will be entitled to share ratably in the net assets legally available for distribution to stockholders after the payment of all of the Company's debts and other liabilities, subject to the satisfaction of any liquidation preference granted to the holders of any outstanding shares of preferred stock.

Rights and Preference. Holders of the Company's Common Stock have no preemptive, conversion or subscription rights, and there is no redemption or sinking fund provisions applicable to our Common Stock. The rights, preferences and privileges of the holders of Common Stock are subject to, and may be adversely affected by, the rights of the holders of shares of any series of the Company's preferred stock that are or may be issued.

Fully Paid and Nonassessable. All of the Company's outstanding shares of Common Stock are fully paid and nonassessable.

Registration Rights. Pursuant to the PIPE SPA, we agreed to (i) prepare and file with the SEC the registration statement of which this prospectus forms a part to permit the resale of the Resale Shares and (ii) subject to certain exceptions, to use reasonable best efforts to keep such registration statement effective under the Securities Act until (x) all Resale Shares the offer and resale of which are registered by the registration statement have been sold, transferred or otherwise disposed of by the Selling Stockholders, (y) the Resale Shares are sold, transferred or otherwise disposed of pursuant to Rule 144 of the Securities Act, or (z) the Resale Shares have become eligible for sale by the Selling Stockholders pursuant to Rule 144 without any restriction on the volume or manner of such sale and all restrictive legends and stop transfer instructions have been removed with respect to all book entries representing the Resale Shares.

Warrants Held by the Selling Stockholders

Pre-Funded Warrants

The following is a summary of certain terms and provisions of the PIPE PFWs. This summary is not complete and is subject to, and qualified in its entirety by, the provisions of the PIPE PFW, the form of

which is filed as an exhibit to the registration statement of which this prospectus forms a part. Prospective investors should carefully review the terms and provisions of the form of PIPE PFW for a complete description of the terms and conditions of the PIPE PFWs.

Duration and Exercise Price. Each PIPE PFW has an initial exercise price per share equal to $0.0001. The PIPE PFWs are immediately exercisable and may be exercised at any time. There is no expiration date for the PIPE PFWs. The exercise price and number of shares of common stock issuable upon exercise of the PIPE PFWs is subject to appropriate adjustment in the event of stock dividends, stock splits, reorganizations or similar events affecting our common stock and the exercise price.

Exercisability. The PIPE PFWs are exercisable, at the option of each holder, in whole or in part, by delivering to us a duly executed exercise notice accompanied by payment in full for the number of shares of our common stock purchased upon such exercise (except in the case of a cashless exercise as discussed below). A holder (together with its affiliates) may not exercise any portion of the PIPE PFWs to the extent that the holder would own more than 4.99% (or, at the election of the holder prior to the issuance of any PIPE PFWs, 9.99%) of the outstanding shares of common stock immediately after exercise. Any holder may increase such percentage to any percentage not in excess of 9.99% upon at least 61 days' prior notice to us. No fractional shares of common stock will be issued in connection with the exercise of a PIPE PFW. In lieu of fractional shares of common stock, we will pay the holder an amount in cash equal to the fractional amount multiplied by the exercise price of such PIPE PFW or round up to the next whole share.

Cashless Exercise. In lieu of making the cash payment of the aggregate exercise price otherwise contemplated to be made to us upon such exercise, the holder may elect instead to receive upon such exercise (either in whole or in part) the net number of shares of common stock determined according to a formula set forth in the PIPE PFWs.

Fundamental Transaction. In the event of a fundamental transaction, as described in the PIPE PFWs and generally including any reorganization, recapitalization or reclassification of our common stock, the sale, transfer or other disposition of all or substantially all of our properties or assets, our consolidation or merger with or into another person, the acquisition of more than 50% of our outstanding shares of common stock, or any person or group becoming the beneficial owner of 50% of the voting power represented by our outstanding shares of common stock, the holders of the PIPE PFWs will be entitled to receive upon exercise of the PIPE PFWs the kind and amount of securities, cash or other property that the holders would have received had they exercised the PIPE PFWs immediately prior to such fundamental transaction.

Transferability. Subject to applicable laws, a PIPE PFW may be transferred at the option of the holder upon surrender of the PIPE PFW to us together with the appropriate instruments of transfer.

No Exchange Listing. We do not intend to list the PIPE PFWs on any securities exchange or nationally recognized trading system.

No Rights as a Stockholder. Except as otherwise provided in the PIPE PFWs or by virtue of such holder's ownership of shares of our common stock, the holders of the PIPE PFWs do not have the rights or privileges of holders of our common stock, including any voting rights.

Series C Warrants

The following is a summary of certain terms and provisions of the Series C Warrants. This summary is not complete and is subject to, and qualified in its entirety by, the provisions of the Series C Warrants, the form of which is filed as an exhibit to the registration statement of which this prospectus forms a part. Prospective investors should carefully review the terms and provisions of the form of Series C Warrants for a complete description of the terms and conditions of the Series C Warrants.

Duration and Exercise Price. Each Series C Warrant has an initial exercise price per share equal to $15.675. The Series C Warrants may be exercised at any time after Shareholder Approval for a period of five years. The exercise price and number of shares of common stock issuable upon exercise of the Series C

Warrants is subject to appropriate adjustment in the event of (i) stock dividends, stock splits, stock combinations, reclassifications, reorganizations or similar events, or (ii) upon any distributions of assets, including cash, stock or other property to our stockholders, or (iii) if, while the Series C Warrants are outstanding, the Company engages in any transaction involving the issuance or sale of shares of common stock or equivalent securities at an effective price per share less than the then exercise price of the Series C Warrants, subject to a floor price of $2.4882 per share. In addition, on the 11th trading day following each of (i) the later of (A) the Stockholder Approval Date and (B) the Effective Date (as that term is defined in the SPA) and (ii) each subsequent date that a Registration Statement (as that term is defined in the SPA) is declared effective by the Securities and Exchange Commission, if any (each such trading day, a "Reset Date"), the Series C Warrants contain a reset of the exercise price to a price equal to the lesser of (i) the then applicable exercise price and (ii) the greater of the Floor Price and the lowest volume weighted average price for the ten trading days immediately preceding the Reset Date. Upon such reset of the exercise price, the number of shares issuable under the Series C Warrants shall be increased such that the aggregate exercise price of the Series C Warrants shall remain unchanged following such reset.

Exercise Limitation. A holder will not have the right to exercise any portion of the Series C Warrants if the holder (together with its affiliates and certain related parties) would beneficially own in excess of 4.99% of the number of shares of our Common Stock outstanding immediately after giving effect to that proposed exercise, as such percentage ownership is determined in accordance with the terms of the Series C Warrants. However, any holder may increase or decrease such percentage to any other percentage not in excess of 9.99%, provided that any increase in such percentage shall not be effective until 61 days following notice from the holder to us.

Transferability. Subject to applicable laws, the Series C Warrants may be offered for sale, sold, transferred or assigned without our consent.

Exchange Listing. We do not intend to list the Series C Warrants on any securities exchange or nationally recognized trading system.

Fundamental Transactions. In the event of a fundamental transaction, as described in the Series C Warrants and generally including any reorganization, recapitalization or reclassification of our Common Stock, the sale, transfer or other disposition of all or substantially all of our properties or assets, our consolidation or merger with or into another person, the acquisition of more than 50% of our outstanding Common Stock, or any person or group becoming the beneficial owner of 50% or more of the voting power represented by our outstanding Common Stock, the holders of the Series C Warrants will be entitled to receive upon exercise of the Series C Warrants the kind and amount of securities, cash or other property that the holders would have received had they exercised the Series C Warrants immediately prior to such fundamental transaction.

Rights as a Stockholder. Except as otherwise provided in the Series C Warrants or by virtue of such holder's ownership of shares of our Common Stock, the holder of a Series C Warrant does not have the rights or privileges of a holder of our Common Stock, including any voting rights, until the holder exercises the Series C Warrant.

Registration Rights. Pursuant to the PIPE SPA, we agreed to (i) prepare and file with the SEC the registration statement of which this prospectus forms a part to permit the resale of the Resale Shares and (ii) subject to certain exceptions, to use reasonable best efforts to keep such registration statement effective under the Securities Act until (x) all Resale Shares the offer and resale of which are registered by the registration statement have been sold, transferred or otherwise disposed of by the Selling Stockholders, (y) the Resale Shares are sold, transferred or otherwise disposed of pursuant to Rule 144 of the Securities Act, or (z) the Resale Shares have become eligible for sale by the Selling Stockholders pursuant to Rule 144 without any restriction on the volume or manner of such sale and all restrictive legends and stop transfer instructions have been removed with respect to all book entries representing the Resale Shares.

Governing Law. The Series C Warrants are governed by New York law.

Series D Warrants

The following is a summary of certain terms and provisions of the Series D Warrants. This summary is not complete and is subject to, and qualified in its entirety by, the provisions of the Series D Warrants, the form of which is filed as an exhibit to the registration statement of which this prospectus forms a part. Prospective investors should carefully review the terms and provisions of the form of Series D Warrants for a complete description of the terms and conditions of the Series D Warrants.

Duration and Exercise Price. Each Series D Warrant has an initial exercise price per share equal to $15.675. The Series D Warrants may be exercised at any time after Shareholder Approval for a period of two and one-half years. Under an alternative cashless exchange provision in the Series D Warrants, holders thereof have the right to receive an aggregate number of shares equal to the product of (i) the aggregate number of common shares that would be issuable upon a cash exercise of the Series D Warrants and (ii) 3.0. In addition, on the 11th trading day following each of (i) the later of (A) the Stockholder Approval Date and (B) the Effective Date (as that term is defined in the SPA) and (ii) each subsequent date that a Registration Statement (as that term is defined in the SPA) is declared effective by the Securities and Exchange Commission, if any (each such trading day, a "Reset Date"). The exercise price and number of shares of common stock issuable upon exercise of the Series D Warrants is subject to appropriate adjustment in the event of (i) stock dividends, stock splits, stock combinations, reclassifications, reorganizations or similar events, or (ii) upon any distributions of assets, including cash, stock or other property to our stockholders. In addition, on the 11th trading day following each of (i) the later of (A) the Stockholder Approval Date and (B) the Effective Date and (ii) each subsequent date that a Registration Statement is declared effective by the Securities and Exchange Commission, if any, the Series D Warrants contain a reset of the exercise price to a price equal to the lesser of (i) the then applicable exercise price and (ii) the greater of the Floor Price and the lowest volume weighted average price for the ten trading days immediately preceding the Reset Date. Upon such reset of the exercise price, the number of shares issuable under the Series D Warrants shall be increased such that the aggregate exercise price of the Series D Warrants shall remain unchanged following such reset.

Exercise Limitation. A holder will not have the right to exercise any portion of the Series D Warrants if the holder (together with its affiliates and certain related parties) would beneficially own in excess of 4.99% of the number of shares of our Common Stock outstanding immediately after giving effect to that proposed exercise, as such percentage ownership is determined in accordance with the terms of the Series D Warrants. However, any holder may increase or decrease such percentage to any other percentage not in excess of 9.99%, provided that any increase in such percentage shall not be effective until 61 days following notice from the holder to us.

Transferability. Subject to applicable laws, the Series D Warrants may be offered for sale, sold, transferred or assigned without our consent.

Exchange Listing. We do not intend to list the Series D Warrants on any securities exchange or nationally recognized trading system.

Fundamental Transactions. In the event of a fundamental transaction, as described in the Series D Warrants and generally including any reorganization, recapitalization or reclassification of our Common Stock, the sale, transfer or other disposition of all or substantially all of our properties or assets, our consolidation or merger with or into another person, the acquisition of more than 50% of our outstanding Common Stock, or any person or group becoming the beneficial owner of 50% or more of the voting power represented by our outstanding Common Stock, the holders of the Series D Warrants will be entitled to receive upon exercise of the Series D Warrants the kind and amount of securities, cash or other property that the holders would have received had they exercised the Series D Warrants immediately prior to such fundamental transaction.

Rights as a Stockholder. Except as otherwise provided in the Series D Warrants or by virtue of such holder's ownership of shares of our Common Stock, the holder of a Series D Warrant does not have the

rights or privileges of a holder of our Common Stock, including any voting rights, until the holder exercises the Series D Warrant.

Registration Rights. Pursuant to the PIPE SPA, we agreed to (i) prepare and file with the SEC the registration statement of which this prospectus forms a part to permit the resale of the Resale Shares and (ii) subject to certain exceptions, to use reasonable best efforts to keep such registration statement effective under the Securities Act until (x) all Resale Shares the offer and resale of which is registered by the registration statement have been sold, transferred or otherwise disposed of by the Selling Stockholders, (y) the Resale Shares are sold, transferred or otherwise disposed of pursuant to Rule 144 of the Securities Act, or (z) the Resale Shares have become eligible for sale by the Selling Stockholders pursuant to Rule 144 without any restriction on the volume or manner of such sale and all restrictive legends and stop transfer instructions have been removed with respect to all book entries representing the Resale Shares.

Governing Law. The Series D Warrants are governed by New York law.

Certain U.S. Federal Income Tax Considerations

The following discussion summarizes certain U.S. federal income tax considerations of the acquisition, ownership and disposition of the Common Stock offered by this prospectus but does not purport to be a complete analysis of all potential tax effects. This discussion does not address effects of other U.S. federal tax laws, such as estate and gift tax laws, or of state, local, non-U.S. or other tax considerations that may be relevant to a purchaser or holder of the Common Stock in light of their particular circumstances. This discussion is based on the U.S. Internal Revenue Code of 1986, as amended (the "Code"), the Treasury regulations promulgated thereunder, judicial decisions, and published rulings and administrative pronouncements of the U.S. Internal Revenue Service (the "IRS"), in each case as of the date hereof. These authorities may change, possibly with retroactive effect, or may be subject to differing interpretations that may adversely affect a holder of the Common Stock. There can be no assurance the IRS or a court will not take a contrary position to that discussed below regarding the acquisition, ownership and disposition of the Common Stock.

This discussion is limited to holders that hold the Common Stock as a capital asset within the meaning of Section 1221 of the Code (generally property held for investment). This discussion does not describe all of the U.S. federal income tax consequences that may be relevant to a holder in light of its particular circumstances, including the impact of the alternative minimum tax and of the Medicare contribution tax on net investment income. In addition, it does not address consequences for holders subject to special rules, including without limitation:

- U.S. expatriates and former citizens or long-term residents of the United States;
- persons holding the Common Stock as part of a hedge, straddle, conversion, or other integrated transaction;
- banks, insurance companies, and other financial institutions;
- brokers, dealers or traders in securities;
- "controlled foreign corporations," "passive foreign investment companies," and corporations that accumulate earnings
- to avoid U.S. federal income tax;
- S corporations or entities or arrangements that are treated as partnerships for U.S. federal income tax purposes (and investors therein);
- tax-exempt organizations or governmental organizations;
- real estate investment trusts or regulated investment companies;
- U.S. persons whose functional currency is not the U.S. dollar;
- persons subject to special tax accounting rules;
- persons who hold or receive the Common Stock pursuant to the exercise of any employee stock option or otherwise as compensation;
- persons deemed to sell our Common Stock under the constructive sale provisions of the Code;
- tax-qualified retirement plans, individual retirement accounts or other tax-deferred accounts; and
- "qualified foreign pension funds" as defined in Section 897(l)(2) of the Code.

If a partnership (or any other entity treated as a partnership for U.S. federal income tax purposes) holds the Common Stock, the U.S. federal income tax treatment of a partner of that partnership generally will depend upon the status of the partner and the activities of the partnership. If you are a partnership or a partner of a partnership holding the Common Stock, you should consult your tax advisors as to the particular U.S. federal income tax consequences of holding and disposing of the Common Stock.

This discussion is for information purposes only and is not tax advice. You should consult your own independent tax advisor concerning the application of the U.S. federal income tax laws to your particular circumstances as

well as any tax consequences for the acquisition, ownership, or disposition of the Common Stock arising under other U.S. federal tax laws and the laws of any state, local or non-U.S. tax jurisdiction or under any applicable income tax treaty.

For purposes of this discussion, a "U.S. holder" is a beneficial owner of our Common Stock that, for U.S. federal income tax purposes, is or is treated as:

- an individual who is a citizen or resident of the United States;
- a corporation created or organized under the laws of the United States, any state thereof, or the District of Columbia;
- an estate the income of which is subject to U.S. federal income taxation regardless of its source; or
- a trust that (i) is subject to the primary supervision of a U.S. court and the control of one or more "United States persons" (within the meaning of Section 770 1(a)(30) of the Code) or (ii) has a valid election in effect to be treated as a United States person for U.S. federal income tax purposes.

A "non-U.S. holder" is any beneficial owner of our Common Stock that is not a U.S. holder.

U.S. Holders

Distributions in General

If distributions are made with respect to the Common Stock, such distributions will be treated as dividends to the extent of our current or accumulated earnings and profits as determined under the Code. Subject to customary conditions and limitations, dividends will be eligible for the dividends-received deduction in the case of U.S. holders that are (or are treated for U.S. federal income tax purposes) as corporations. Dividends paid to non-corporate U.S. holders generally will qualify for taxation at preferential rates if those holders meet certain holding period and other applicable requirements. Dividends received by non-corporate U.S. holders may also be subject to the additional 3.8% tax on net investment income. Any portion of a distribution that exceeds our current and accumulated earnings and profits will first be applied to reduce a U.S. holder's tax basis in the Common Stock, but not below zero. Distributions in excess of our current and accumulated earnings and profits and in excess of a U.S. holder's tax basis in its shares will be taxable as gain from the disposition of the Common Stock, the tax treatment of which is discussed below.

Extraordinary Dividends

Dividends that exceed certain thresholds in relation to a U.S. holder's tax basis in the Common Stock could be characterized as "extraordinary dividends" under Section 1059 of the Code. Corporate U.S. holders that have held our Common Stock for two years or less before the dividend announcement date and that receive an extraordinary dividend will generally be required to reduce their tax basis in the stock by the nontaxed portion of the dividend due to the dividends-received deduction. If the amount of reduction exceeds the U.S. holder's tax basis in the stock, the excess will be taxable as gain from the disposition of the stock, the tax treatment of which is discussed below. Non-corporate U.S. holders that receive an extraordinary dividend will be required to treat any losses on the sale of our Common Stock as long-term capital losses to the extent of the extraordinary dividends such U.S. holders receive that qualify for taxation as the preferential rates discussed above under "— Distributions in General." U.S. holders are urged to consult their tax advisors with respect to the eligibility for and amount of any dividend received deduction and the application of Section 1059 of the Code to any dividends they receive.

Disposition of Common Stock by Sale, Exchange or Redemption

Upon any sale or disposition (other than certain redemptions, as discussed below) of the Common Stock, a U.S. holder generally will recognize capital gain or loss equal to the difference between the amount realized by the U.S. holder and the U.S. holder's adjusted tax basis in the Common Stock. Such capital gain or loss will be long-term capital gain or loss if the U.S. holder's holding period for the Common Stock is longer than

one year. Non-corporate U.S. holders may be eligible for preferential tax rates on long-term capital gains but also may be subject to the additional 3.8% tax on net investment income. The deductibility of capital losses is subject to limitations.

A redemption of the Common Stock will be treated as a sale or exchange described in the preceding paragraph if the redemption, based on the facts and circumstances, is treated for U.S. federal income tax purposes as (i) a "complete termination" of your interest in the Common Stock, (ii) a "substantially disproportionate" redemption of your Common Stock, or (iii) is "not essentially equivalent to a dividend", each within the meaning of Section 302 of the Code. In determining whether any of these tests has been met, you must take into account not only the Common Stock and other equity interests that you actually own but also other equity interests that you constructively own under U.S. federal income tax rules.

If you meet none of the alternative tests described above, the redemption will be treated as a distribution subject to the rules described under "— Distributions In General." If a redemption of the Common Stock is treated as a distribution that is taxable as a dividend, you are urged to consult your tax advisor regarding the allocation of your tax basis as between the redeemed and remaining shares of Common Stock.

Information Reporting and Backup Withholding

We or an applicable withholding agent will report to our U.S. holders and the IRS the amount of dividends (including deemed dividends) paid during each year and the amount of any tax withheld with respect to the Common Stock. Certain non-corporate U.S. holders may be subject to U.S. backup withholding at a rate of 28% on payments of dividends on the Common Stock unless the holder furnishes the payor or its agent with a taxpayer identification number, certified under penalties of perjury, and certain other information or otherwise establishes an exemption from backup withholding. Backup withholding tax is not an additional tax. Any amounts withheld under the backup withholding rules may be allowed as a refund or a credit against a U.S. holder's U.S. federal income tax liability, provided the U.S. holder timely furnishes the required information to the IRS.

Non-U.S. Holders

Distributions

If distributions are made with respect to the Common Stock, such distributions will be treated as dividends to the extent of our current or accumulated earnings and profits as determined under the Code and may be subject to withholding as discussed below. Any portion of a distribution that exceeds our current and accumulated earnings and profits will first be applied to reduce the Non-U.S. holder's basis in the Common Stock, but not below zero. If the distribution exceeds our current and accumulated earnings and profits and the Non-U.S. holder's basis, the excess will be treated as gain from the disposition of the Common Stock, the tax treatment of which is discussed below.

In addition, if we are classified as a U.S. real property holding corporation (a "USRPHC") within the meaning of Section 897(c) of the Code and any distribution exceeds our current and accumulated earnings and profits, we will need to satisfy our withholding requirements either by (a) treating the entire distribution (even if in excess of earnings and profits) as a dividend subject to the withholding rules described below and withhold at a minimum rate of 15% or such lower rate as may be specified by an applicable income tax treaty for distributions from a USRPHC; or (b) treating (i) only the amount of the distribution equal to our reasonable estimate of our current and accumulated earnings and profits as a dividend subject to the withholding rules in the following paragraph; and (ii) the excess portion of the distribution as subject to withholding at a rate of 15% (or such lower rate as may be specified by an applicable income tax treaty), as if such excess were the result of a sale of shares in a USRPHC, with a credit generally allowed against the Non-U.S. holder's U.S. federal income tax liability for the tax withheld from such excess. We believe that we currently are not a USRPHC, and we do not expect to become a USRPHC for the foreseeable future (see discussion of USRPHCs below under "— *Disposition of Common Stock, Including Redemptions*").

Dividends (including amounts distributed by a USRPHC and subject to withholding as dividends per the preceding paragraph) paid to a Non-U.S. holder of the Common Stock will be subject to withholding of U.S.

federal income tax at a 30% rate or such lower rate as may be specified by an applicable income tax treaty. However, dividends that are treated as being effectively connected with the conduct of a trade or business by the Non-U.S. holder within the United States (and, where a tax treaty applies, are attributable to a permanent establishment maintained by the Non-U.S. holder in the United States) are not subject to this withholding tax, provided that certain certification and disclosure requirements are satisfied including completing IRS Form W-8ECI (or other applicable form). Instead, such dividends are subject to U.S. federal income tax on a net income basis in the same manner as if the Non-U.S. holder were a United States person (as defined under the Code), unless an applicable income tax treaty provides otherwise. Any such effectively connected dividends received by a foreign corporation may be subject to an additional "branch profits tax" at a 30% rate or such lower rate as may be specified by an applicable income tax treaty.

A Non-U.S. holder of the Common Stock who wishes to claim the benefit of an applicable treaty rate and avoid backup withholding for dividends, as discussed below, will be required to (i) complete IRS Form W-8BEN or Form W-8BEN-E (or other applicable form) and certify under penalty of perjury that such holder is not a United States person as defined under the Code and is eligible for treaty benefits, or (ii) if the Common Stock is held through certain foreign intermediaries, satisfy the relevant certification requirements of applicable Treasury regulations. A Non-U.S. holder of the Common Stock eligible for a reduced rate of U.S. withholding tax pursuant to an income tax treaty may obtain a refund of any excess amounts withheld by timely filing an appropriate claim for refund with the U.S. Internal Revenue Service.

Disposition of Common Stock, Including Redemptions

Any gain realized by a Non-U.S. holder on the disposition of the Common Stock generally will not be subject to U.S. federal income or withholding tax unless:

- the gain is effectively connected with the conduct of a trade or business by the Non-U.S. holder in the United States (and, if required by an applicable income tax treaty, attributable to a permanent establishment maintained by the Non-U.S. holder in the United States);
- the Non-U.S. holder is an individual who is present in the United States for 183 days or more in the taxable year of disposition, and certain other conditions are met; or
- we are or have been a USRPHC, as defined in Section 897(c) of the Code, and a Non-U.S. holder owned directly or pursuant to applicable attribution rules at any time during the five-year period ending on the date of disposition more than 5% of the Common Stock — assuming that the Common Stock is regularly traded on an established securities market, within the meaning of Section 897(c)(3) of the Code.

A Non-U.S. holder described in the first bullet point immediately above will generally be subject to tax on the gain derived from the sale under regular graduated U.S. federal income tax rates in the same manner as if the Non-U.S. holder were a United States person as defined under the Code, and, if it is a corporation, may also be subject to branch profits tax equal of 30% (generally applicable to its effectively connected earnings and profits) or at such lower rate as may be specified by an applicable income tax treaty.

An individual Non-U.S. holder described in the second bullet point immediately above will be subject to a flat 30% tax (or at such reduced rate as may be provided by an applicable tax treaty) on the gain derived from the sale, which may be offset by U.S. source capital losses, even if the individual is not considered a resident of the United States for U.S. federal income tax purposes.

A Non-U.S. holder described in the third bullet point above will be subject to U.S. federal income tax under regular graduated U.S. federal income tax rates with respect to the gain realized in the same manner as if the Non-U.S. holder were a United States person as defined under the Code. A corporation is a USRPHC if it is a U.S. corporation and the fair market value of its U.S. real property interests equals or exceeds 50% of the sum of the fair market value of its worldwide real property interests and its other assets used or held for use in a trade or business. We believe that we currently are not a USRPHC for U.S. federal income tax purposes, and we do not expect to become a USRPHC for the foreseeable future. Our Common Stock will be listed on the NASDAQ Capital Market and we believe that, for as long as we continue to be so listed, our

Common Stock will be treated as regularly traded on an established securities market. However, if we become a USRPHC and our Common Stock is regularly traded on an established securities market, a Non-U.S. holder generally will be subject to U.S. federal income tax on any gain from the disposition of such stock if such Non-U.S. holder has owned or is deemed to have owned more than 5% of our Common Stock, at any time within the shorter of the five-year period preceding the disposition or such holder's holding period for such stock.

If a Non-U.S. holder is subject to U.S. federal income tax on any sale, exchange, redemption (except as discussed below), or other disposition of the Common Stock, the Non-U.S. holder will recognize capital gain or loss equal to the difference between the amount realized by the Non-U.S. holder and the Non-U.S. holder's adjusted tax basis in the Common Stock. Such capital gain or loss will be long-term capital gain or loss if the Non-U.S. holder's holding period for the Common Stock is longer than one year. A Non-U.S. holder should consult its own independent tax advisors with respect to applicable tax rates and netting rules for capital gains and losses. Certain limitations exist on the deduction of capital losses by both corporate and non-corporate taxpayers.

If a Non-U.S. holder is subject to U.S. federal income tax on any disposition of the Common Stock, a redemption of shares of the Common Stock will be a taxable event. If the redemption is treated as a sale or exchange, instead of as a dividend, a Non-U.S. holder generally will recognize capital gain or loss, equal to the difference between the amount of cash received and fair market value of any property received and the Non-U.S. holder's adjusted tax basis in the Common Stock redeemed (except that to the extent that any cash received is attributable to any accrued but unpaid dividends), and such capital gain or loss will be long-term capital gain or loss if the Non-U.S. holder's holding period for such Common Stock exceeds one year,. A payment made in redemption of the Common Stock may be treated as a dividend (subject to taxation as discussed above under "— *Disposition of Common Stock, Including Redemptions*"), rather than as payment in exchange for the Common Stock, in the same circumstances discussed above under "— *Disposition of Common Stock, Including Redemptions*." Each Non-U.S. holder of the Common Stock should consult its own independent tax advisors to determine whether a payment made in redemption of the Common Stock will be treated as a dividend or as payment in exchange for the Common Stock.

Information Reporting and Backup Withholding

We must annually report to the IRS and to each Non-U.S. holder the amount of dividends (including constructive dividends) paid to such Non-U.S. holder and the tax withheld with respect to such dividends, regardless of whether withholding was required. Copies of the information returns reporting such dividends and withholding may also be made available under the provisions of an applicable tax treaty or agreement with the tax authorities in the country in which the non-U.S. holder resides. U.S. backup withholding will generally apply to the payment of dividends to non-U.S. holders unless such non-U.S. holders furnish to the payor an IRS Form W-8BEN or Form W-8BEN-E (or other applicable form) or otherwise establish an exemption.

Payment by a U.S. office of a broker of the proceeds of a sale of shares of our Common Stock is subject to both backup withholding and information reporting unless the non-U.S. holder, or beneficial owner thereof, as applicable, certifies that it is a non-U.S. holder on Form W-8BEN or Form W-8BEN-E (or other suitable substitute or successor form), or otherwise establishes an exemption. Subject to certain exceptions, backup withholding and information reporting generally will not apply to a payment of proceeds from the sale of shares of our Common Stock if such sale is effected through a foreign office of a broker, provided that the broker does not have certain U.S. connections. Any amount withheld under the backup withholding rules from a payment to a non-U.S. holder is allowable as a credit against such holder's U.S. federal income tax liability (if any), which may entitle the holder to a refund if in excess of such liability, provided that the holder timely provides the required information to the IRS. Non-U.S. holders are urged to consult their own tax advisers regarding the application of backup withholding in their particular circumstances and the availability of and procedure for obtaining an exemption from backup withholding under current Treasury Regulations.

Foreign Account Tax Compliance Act

Sections 1471 to 1474 of the Code (such sections, and the Treasury Regulations and administrative guidance issued thereunder, commonly referred to as FATCA) impose a 30% U.S. withholding tax on certain "withholdable payments" made to a "foreign financial institution" or a "nonfinancial foreign entity." "Withholdable payments" include payments of dividends and the gross proceeds from a disposition of certain property (such as shares of our Common Stock), if such disposition occurs after December 31, 2018. In general, if a holder is a "foreign financial institution" (which includes investment entities such as hedge funds and private equity funds), the 30% withholding tax will apply to withholdable payments made to such holder, unless such holder enters into an agreement with the U.S. Department of Treasury to collect and provide substantial information regarding its U.S. account holders, including certain account holders that are foreign entities with U.S. owners, and to withhold 30% on certain "pass-through payments." If such holder is a "non-financial foreign entity," FATCA also generally will impose a withholding tax of 30% on withholdable payments made to such holder unless the holder provides the withholding agent with a certification that it does not have any "substantial United States owners" or a certification identifying its direct and indirect substantial United States owners. Intergovernmental agreements between the United States and a holder's resident country may modify some of the foregoing requirements.

Although withholding under FATCA would also have applied to payments of gross proceeds from the sale or other disposition of the Common Stock on or after January 1, 2019, Treasury Regulations proposed in late 2018 eliminate FATCA withholding on payments of gross proceeds entirely. Taxpayers generally may rely on these proposed Treasury Regulations until final Treasury Regulations are issued.

We will not pay any additional amounts to holders of the Common Stock in respect of any amounts withheld. Non-U.S. holders should consult their own tax advisers with respect to the U.S. federal income tax consequences of FATCA on their ownership and disposition of shares of our Common Stock.

Documentation that holders provide in order to be treated as FATCA compliant may be reported to the IRS and other tax authorities, including information about a holder's identity, its FATCA status and if applicable, its direct and indirect U.S. owners. Prospective investors should consult their tax advisers about how information reporting and the possible imposition of withholding tax under FATCA may apply to their investment in the Common Stock.

Plan of Distribution

The Selling Stockholders, which as used herein includes donees, pledgees, transferees or other successors-in-interest selling Resale Shares or interests in Resale Shares received after the date of this prospectus from a Selling Stockholder as a gift, pledge, partnership distribution or other transfer, may, from time to time, sell, transfer or otherwise dispose of any or all of their Resale Shares or interests in Resale Shares on any stock exchange, market or trading facility on which the shares are traded or in private transactions. These dispositions may be at fixed prices, at prevailing market prices at the time of sale, at prices related to the prevailing market price, at varying prices determined at the time of sale, or at negotiated prices.

The Selling Stockholders may use any one or more of the following methods when disposing of shares or interests therein:

- ordinary brokerage transactions and transactions in which the broker-dealer solicits purchasers;
- block trades in which the broker-dealer will attempt to sell the shares as agent, but may position and resell a portion of the block as principal to facilitate the transaction;
- purchases by a broker-dealer as principal and resale by the broker-dealer for its account;
- an exchange distribution in accordance with the rules of the applicable exchange;
- privately negotiated transactions;
- short sales effected after the date the registration statement of which this prospectus is a part is declared effective by the SEC;
- through the writing or settlement of options or other hedging transactions, whether through an options exchange or otherwise;
- broker-dealers may agree with the Selling Stockholders to sell a specified number of such shares at a stipulated price per share;
- a combination of any such methods of sale; and
- any other method permitted by applicable law.

The Selling Stockholders may, from time to time, pledge or grant a security interest in some or all of the Resale Shares owned by them and, if they default in the performance of their secured obligations, the pledgees or secured parties may offer and sell the Resale Shares, from time to time, under this prospectus, or under an amendment to this prospectus under Rule 424(b)(3) or other applicable provision of the Securities Act amending the list of Selling Stockholders to include the pledgee, transferee or other successor in interest as Selling Stockholders under this prospectus. The Selling Stockholders also may transfer the Resale Shares in other circumstances, in which case the transferees, pledgees or other successors in interest will be the selling beneficial owners for purposes of this prospectus.

In connection with the sale of shares of our Common Stock or interests therein under this prospectus, the Selling Stockholders may enter into hedging transactions with broker-dealers or other financial institutions, which may in turn engage in short sales of shares of our Common Stock in the course of hedging the positions they assume. The Selling Stockholders may also sell shares of our Common Stock short and deliver these securities to close out their short positions, or loan or pledge the shares to broker-dealers that in turn may sell these securities. The Selling Stockholders may also enter into option or other transactions with broker-dealers or other financial institutions or the creation of one or more derivative securities which require the delivery to such broker-dealer or other financial institution of shares offered by this prospectus, which shares such broker-dealer or other financial institution may resell pursuant to this prospectus (as supplemented or amended to reflect such transaction).

The aggregate proceeds to the Selling Stockholders from the sale of the Resale Shares offered by them will be the purchase price of the Resale Shares less discounts or commissions, if any. Each of the Selling Stockholders reserves the right to accept and, together with their agents from time to time, to reject, in

whole or in part, any proposed purchase of Resale Shares to be made directly or through agents. We will not receive any of the proceeds from sales of Resale Shares effected by the Selling Stockholders.

The Selling Stockholders also may resell all or a portion of the shares in open market transactions in reliance upon Rule 144 under the Securities Act of 1933, provided that they meet the criteria and conform to the requirements of that rule.

The Selling Stockholders and any underwriters, broker-dealers or agents that participate in the sale of the Resale Shares or interests therein may be "underwriters" within the meaning of Section 2(11) of the Securities Act. Any discounts, commissions, concessions or profit they earn on any resale of the Resale Shares may be underwriting discounts and commissions under the Securities Act. Selling Stockholders who are "underwriters" within the meaning of Section 2(11) of the Securities Act will be subject to the prospectus delivery requirements of the Securities Act.

To the extent required, the shares of our Common Stock to be sold, the names of the Selling Stockholders, the respective purchase prices and offering prices, the names of any agents, broker-dealer or underwriter, any applicable commissions or discounts with respect to a particular offer will be set forth in an accompanying prospectus supplement or, if appropriate, a post-effective amendment to the registration statement that includes this prospectus.

In order to comply with the securities laws of some states, if applicable, the Resale Shares may be sold in these jurisdictions only through registered or licensed brokers or dealers. In addition, in some states, the Common Stock may not be sold unless it has been registered or qualified for sale or an exemption from registration or qualification requirements is available and is complied with.

We have advised the Selling Stockholders that the anti-manipulation rules of Regulation M under the Exchange Act may apply to sales of shares in the market and to the activities of the Selling Stockholders and their affiliates. In addition, to the extent applicable, we will make copies of this prospectus (as it may be supplemented or amended from time to time) available to the Selling Stockholders for the purpose of satisfying the prospectus delivery requirements of the Securities Act. The Selling Stockholders may indemnify any broker-dealer that participates in transactions involving the sale of shares against certain liabilities, including liabilities arising under the Securities Act.

We have agreed to indemnify the Selling Stockholders against liabilities, including liabilities under the Securities Act and state securities laws, relating to the registration of the shares offered by this prospectus.

We have agreed with the Selling Stockholders to keep the registration statement of which this prospectus constitutes a part effective until the earlier of (x) all Resale Shares the offer and resale of which are registered by the registration statement have been sold, transferred or otherwise disposed of by the Selling Stockholders, (y) the Resale Shares are sold, transferred or otherwise disposed of pursuant to Rule 144 of the Securities Act, or (z) the Resale Shares have become eligible for sale by the Selling Stockholders pursuant to Rule 144 without any restriction on the volume or manner of such sale and all restrictive legends and stop transfer instructions have been removed with respect to all book entries representing the Resale Shares.

Legal Matters

Certain legal matters will be passed upon for us by Goodwin Procter LLP. Additional legal matters may be passed upon for us or any underwriters, dealers or agents, by counsel that we will name in the applicable prospectus supplement.

Experts

Our financial statements as of and for the years ended December 31, 2023 and 2022, included in this Registration Statement or incorporated herein by reference have been audited by Withum Smith+Brown, PC, independent registered public accounting firm, as stated in their report appearing herein or therein (which report includes an explanatory paragraph about the existence of substantial doubt concerning our ability to continue as a going concern). Such financial statements have been so included in reliance upon the authority of said firm as experts in accounting and auditing.

Where You Can Find More Information

We have filed with the SEC a registration statement on Form S-1 under the Securities Act with respect to the Common Stock offered hereby. This prospectus does not contain all of the information set forth in the registration statement and the exhibits and schedules thereto. For further information with respect to the Company and its Common Stock, reference is made to the registration statement and the exhibits and any schedules filed therewith. Statements contained in this prospectus as to the contents of any contract or other document referred to are not necessarily complete and, in each instance, if such contract or document is filed as an exhibit, reference is made to the copy of such contract or other document filed as an exhibit to the registration statement, each statement being qualified in all respects by such reference.

We are subject to the information reporting requirements of the Exchange Act, and we file periodic reports and other information with the SEC. These filings include our Annual Report on Form 10-K, Quarterly Reports on Form 10-Q, Current Reports on Form 8-K and proxy statements on Schedule 14A, as well as any amendments to those reports and proxy statements, which are available free of charge through our website as soon as reasonably practicable after we file them with, or furnish them to, the SEC. Our Internet website address is www.transcodetherapeutics.com. Our website and the information contained on, or that can be accessed through, the website will not be deemed to be incorporated by reference in, and are not considered part of, this prospectus. You should not rely on any such information in making your decision whether to purchase our securities. The SEC also maintains a website at www.sec.gov that contains reports, proxy and information statements and other information regarding us and other issuers that file electronically with the SEC.

Incorporation of Certain Documents by Reference

The SEC allows us to incorporate into this prospectus by reference the information and reports we file with it, which means that we can disclose important information to you by referring you to these documents. The information incorporated by reference is an important part of this prospectus and information that we file after the date hereof with the SEC will automatically update and supersede the information already incorporated by reference. We are incorporating by reference the documents listed below, which we have already filed with the SEC, and any future filings we make with the SEC under Sections 13(a), 13(c), 14 or 15(d) of the Exchange Act, except as to any portion of any future report or document that is not deemed filed under such provisions, after the date of this prospectus and prior to the termination of this offering:

- our Annual Report on Form 10-K for the fiscal year ended December 31, 2023, filed with the SEC on April 1, 2024;
- the information included in our Definitive Proxy Statement on Schedule 14A, filed with the SEC on May 20, 2024, to the extent incorporated by reference into Part III of the Annual Report on Form 10-K for the fiscal year ended December 31, 2023;
- our Quarterly Reports on Form 10-Q for the quarter ended March 31, 2024, filed with the SEC on May 15, 2024, for the quarter ended June 30, 2024, filed with the SEC on August 14, 2024, and for the quarter ended September 30, 2024, filed with the SEC on November 14, 2024;
- our Current Reports on Form 8-K filed with the SEC on January 8, 2024; January 16, 2024; January 22, 2024; January 31, 2024; April 5, 2024; April 23, 2024; May 10, 2024; May 15, 2024; June 7, 2024; June 14, 2024; July 24, 2024; August 16, 2024; August 28, 2024; September 27, 2024; November 6, 2024; November 25, 2024; November 29, 2024, and December 2, 2024; and
- the description of our common stock contained in our registration statement on Form 8-A filed with the SEC on April 26, 2021, as supplemented by the description of our common stock contained in Exhibit 4.1 to our Annual Report on Form 10-K for the year ended December 31, 2023, filed with the SEC on April 1, 2024, and any amendment or report filed with the SEC for the purpose of updating such description.

Pursuant to Rule 412 under the Securities Act, any statement contained in a document incorporated or deemed to be incorporated by reference into this prospectus will be deemed to be modified or superseded for purposes of this prospectus to the extent that a statement contained in this prospectus or any other subsequently filed document that is deemed to be incorporated by reference into this prospectus modifies or supersedes the statement. Any statement so modified or superseded will not be deemed, except as so modified or superseded, to constitute a part of this prospectus.

Upon request, we will provide, without charge, to each person, including any beneficial owner, to whom a copy of this prospectus is delivered, a copy of the documents incorporated by reference into this prospectus but not delivered with the prospectus. You may request a copy of these filings, and any exhibits we have specifically incorporated by reference as an exhibit in this prospectus, at no cost, by writing to us at the following address: Investor Relations Department, TransCode Therapeutics, Inc., 6 Liberty Square, #2382, Boston, Massachusetts 02109. These filings may also be obtained through our website located at https://www.transcodetherapeutics.com. The reference to our website is intended to be an inactive textual reference and, except for the documents incorporated by reference as noted above, the information on, or accessible through, our website is not intended to be part of this prospectus. You should rely only on the information incorporated by reference or provided in this prospectus. We have not authorized anyone else to provide you with different information. You should not assume that the information in this prospectus or in the documents incorporated by reference is accurate as of any date other than the date on the front of this prospectus or those documents.

TransCode Therapeutics, Inc.

173,033 Shares of Common Stock
470,007 shares of Common Stock underlying the Pre-Funded Warrants
Up to 4,050,953 shares of Common Stock underlying the Series C Warrants
Up to 12,152,856 shares of Common Stock underlying the Series D Warrants

PROSPECTUS

December , 2024

Part II
Information not required in prospectus

Item 13. Other Expenses of Issuance and Distribution

	Amount to Be Paid
U.S. Securities and Exchange Commission registration fee	$ 7,397.54
Legal fees and expenses	$ 25,000
Accounting fees and expenses	$ 25,000
Total	$ 57,397.54

Item 14. Indemnification of Directors and Officers

Under the General Corporation Law of the State of Delaware ("DGCL"), a corporation may include provisions in its certificate of incorporation that will relieve its directors of monetary liability for breaches of their fiduciary duty to the corporation, except under certain circumstances, including a breach of the director's duty of loyalty, acts or omissions of the director not in good faith or which involve intentional misconduct or a knowing violation of law, the approval of an improper payment of a dividend or an improper purchase by the corporation of stock or any transaction from which the director derived an improper personal benefit. The Company's Amended and Restated Certificate of Incorporation eliminates the personal liability of directors to the Company or its stockholders for monetary damages for breach of fiduciary duty as a director with certain limited exceptions set forth in the DGCL.

Section 145 of the DGCL grants to corporations the power to indemnify each officer and director against liabilities and expenses incurred by reason of the fact that he or she is or was an officer or director of the corporation if he or she acted in good faith and in a manner he or she reasonably believed to be in or not opposed to the best interests of the corporation and, with respect to any criminal action or proceeding, had no reasonable cause to believe his or her conduct was unlawful. The Company's Amended and Restated Certificate of Incorporation and Bylaws provide for indemnification of each officer and director of the Company to the fullest extent permitted by the DGCL. Section 145 also empowers corporations to purchase and maintain insurance on behalf of any person who is or was an officer or director of the corporation against liability asserted against or incurred by him in any such capacity, whether or not the corporation would have the power to indemnify such officer or director against such liability under the provisions of Section 145.

We have adopted provisions in our amended and restated certificate of incorporation and amended and restated bylaws to be in effect immediately prior to the completion of this offering that limit or eliminate the personal liability of our directors to the fullest extent permitted by the DGCL, as it now exists or may in the future be amended. Consequently, a director will not be personally liable to us or our stockholders for monetary damages or breach of fiduciary duty as a director, except for liability for any breach of the director's duty of loyalty to us or our stockholders; any act or omission not in good faith or that involves intentional misconduct or a knowing violation of law; any unlawful payments related to dividends or unlawful stock purchases, redemptions or other distributions; or any transaction from which the director derived an improper personal benefit.

These limitations of liability do not alter director liability under the federal securities laws and do not affect the availability of equitable remedies such as an injunction or rescission.

In addition, our bylaws provide that:

- we will indemnify our directors, officers and, in the discretion of our board of directors, certain employees to the fullest extent permitted by the DGCL, as it now exists or may in the future be amended; and

- we will advance reasonable expenses, including attorneys' fees, to our directors and, in the discretion of our board of directors, to our officers and certain employees, in connection with legal proceedings relating to their service for or on behalf of us, subject to limited exceptions.

We intend to enter into indemnification agreements with each of our directors, executive officers, and other officers as determined from time to time by our board of directors or our remuneration committee. These agreements will provide that we will indemnify each of our directors, officers with whom we have entered into indemnification agreements, and, at times, their affiliates to the fullest extent permitted by Delaware law.

We will advance expenses, including attorneys' fees (but excluding judgments, fines and settlement amounts), to each indemnified director, executive officer or affiliate in connection with any proceeding in which indemnification is available and we will indemnify our directors and officers for certain actions or proceedings arising out of that person's services as a director or officer brought on behalf of us or in furtherance of our rights. Additionally, certain of our directors or officers may have certain rights to indemnification, advancement of expenses or insurance provided by their affiliates or other third-parties, which indemnification relates to and might apply to the same proceedings arising out of such director's or officer's services as a director referenced herein. Nonetheless, we will agree in the indemnification agreements that our obligations to those same directors or officers are primary and any obligation of such affiliates or other third-parties to advance expenses or to provide indemnification for the expenses or liabilities incurred by those directors are secondary.

We will maintain general liability insurance which covers certain liabilities of our directors and officers arising out of claims based on acts or omissions in their capacities as directors or officers, including liabilities under the Securities Act of 1933, as amended, or the Securities Act.

Part II

Item 15. Recent Sales of Unregistered Securities

In the three years preceding the filing of this registration statement, we have issued the following securities that were not registered under the Securities Act. No underwriters were involved in the sales and the certificates representing the securities sold and issued contain legends restricting transfer of the securities without registration under the Securities Act or an applicable exemption from registration.

(a) In February 2023, in connection with an agreement we entered into with a consultant, we agreed to issue warrants to purchase up to 12,500 shares of common stock at $10.00 per share. These warrants are exercisable any time after six months from the effective date of the agreement (February 23, 2023) through the fifth anniversary thereof, subject to our right in our sole discretion exercisable not later than August 22, 2023, to reduce the number of warrants to 6,250. This right was exercised on May 31, 2023.

(b) In February 2023, in connection with our registered direct offering, we issued as compensation to the placement agent in that transaction warrants to purchase up to 9,962 shares of common stock exercisable at $13.18 per share. These warrants are exercisable beginning six months after the closing of the offering and expire five years after issuance.

(c) In December 2023, in connection with our registered direct offering, we issued as compensation to the placement agent in that transaction warrants to purchase up to 300,000 shares of common stock exercisable at $0.3025 per share. These warrants are exercisable immediately after the closing of the offering and expire five years the date sales in the Offering commenced.

(d) On July 22, 2024, we entered into a Placement Agency Agreement (the “Agreement”) with ThinkEquity LLC (the “Placement Agent”), pursuant to which, as part of its compensation for acting as placement agent, we issued to the Placement Agent, warrants to purchase 500,000 shares of Common Stock (the “Placement Agent Warrants”). The Placement Agent Warrants are exercisable commencing January 18, 2025, expire July 22, 2029, and have an exercise price of $0.375 per share.

(e) On November 26, 2024, we entered into a Stock Purchase Agreement (the “PIPE Agreement”) with the Selling Stockholders pursuant to which we issued our Series C Warrants and Series D Warrants (together, the PIPE Warrants). The Series C Warrants are exercisable for five years after shareholder approval of the PIPE at an exercise price of $0.475 per share. The Series D Warrants are exercisable for two and one-half years after shareholder approval of the PIPE at an exercise price of $0.475 per share.

The issuances of certain of the securities described above were deemed to be exempt from registration pursuant to Section 4(a)(2) of the Securities Act or Rule 701 promulgated under the Securities Act as transactions pursuant to compensatory benefit plans. The shares of common stock issued upon the exercise of options are deemed to be restricted securities for purposes of the Securities Act.

Part II

Item 16. Exhibits and Financial Statement Schedules

The Exhibit Index set forth below is incorporated by reference in response to this Item.

Exhibit Number	Description
3.1	Amended and Restated Certificate of Incorporation of TransCode Therapeutics, Inc. (Incorporated by reference to Exhibit 3.3 to the Registrant's Amendment No. 2 to Registration Statement on Form S-1, filed on April 8, 2021 (File No. 333-253599)).
3.2	Certificate of Amendment to Amended and Restated Certificate of Incorporation of TransCode Therapeutics, Inc. (Incorporated by reference to Exhibit 3.2 to the Registrant's Form 10-K for the year ended December 31, 2023, filed on April 1, 2024).
3.3	Certificate of Amendment to Amended and Restated Certificate of Incorporation of TransCode Therapeutics, Inc. (Incorporated by reference to Exhibit 3.1 to the Registrant's Current Report on Form 8-K, filed on January 16, 2024).
3.4	Certificate of Amendment to Amended and Restated Certificate of Incorporation of TransCode Therapeutics, Inc. (Incorporated by Reference to Exhibit 3.1 to the Registrant's Current Report on Form 8-K filed on November 29, 2024).
3.5	Amended and Restated Bylaws of TransCode Therapeutics, Inc. (Incorporated by reference to Exhibit 3.5 to the Registrant's Registration Statement on Form S-1, filed on February 26, 2021 (File No. 333-253599)).
3.6	Amendment No. 1 to the Amended and Restated Bylaws of TransCode Therapeutics, Inc., effective as of December 8, 2023 (Incorporated by reference to Exhibit 3.1 to the Registrant's Current Report on Form 8-K, filed on December 8, 2023).
4.1	Form of Pre-funded Warrant (Incorporated by reference to Exhibit 4.1 to the Registrant's Current Report on Form 8-K, filed on December 2, 2024).
4.2	Form of Series C Warrant (Incorporated by reference to Exhibit 4.2 to the Registrant's Current Report on Form 8-K, filed on December 2, 2024).
4.3	Form of Series D Warrant (Incorporated by reference to Exhibit 4.3 to the Registrant's Current Report on Form 8-K, filed on December 2, 2024).
5.1*	Opinion of Goodwin Procter LLP.
10.1#	2020 Stock Option and Incentive Plan and form of award agreements thereunder (Incorporated by reference to Exhibit 10.1 to the Registrant's Registration Statement on Form S-1, filed on February 26, 2021 (File No. 333-253599).
10.2#	2021 Stock Option and Incentive Plan and form of award agreements thereunder (Incorporated by reference to Exhibit 10.2 to the Registrant's Amendment No. 1 to Registration Statement on Form S-1, filed on March 24, 2021 (File No. 333-253599).
10.3#	Senior Executive Cash Incentive Bonus Plan (Incorporated by reference to Exhibit 10.3 to the Registrant's Amendment No. 1 to Registration Statement on Form S-1, filed on March 24, 2021 (File No. 333-253599).
10.4#	Form of Indemnification Agreement between the Registrant and each of its executive officers (Incorporated by reference to Exhibit 10.4 to the Registrant's Amendment No. 1 to Registration Statement on Form S-1, filed on March 24, 2021 (File No. 333-253599).
10.5#	Form of Indemnification Agreement between the Registrant and each of its directors (Incorporated by reference to Exhibit 10.5 to the Registrant's Amendment No. 1 to Registration Statement on Form S-1, filed on March 24, 2021 (File No. 333-253599)).
10.6†	Exclusive Patent License Agreement by and between TransCode Therapeutics, Inc. and The General Hospital Corporation, d/b/a Massachusetts General Hospital, dated as of October 26, 2018 (Incorporated by reference to Exhibit 10.7 to the Registrant's Registration Statement on Form S-1, filed on February 26, 2021 (File No. 333-253599)).

Exhibit Number	Description
10.7†	First Amendment to Exclusive Patent License Agreement by and between TransCode Therapeutics, Inc. and The General Hospital Corporation, d/b/a Massachusetts General Hospital, dated as of October 30, 2020 (Incorporated by reference to Exhibit 10.8 to the Registrant's Registration Statement on Form S-1, filed on February 26, 2021 (File No. 333-253599)).
10.8#	2021 Employee Stock Purchase Plan (Incorporated by reference to Exhibit 10.8 to the Registrant's Registration Statement on Form S-1, filed on March 24, 2021 (File No. 333-253599)).
10.9#	Separation Agreement, dated January 10, 2024, by and between TransCode Therapeutics, Inc. and Robert Michael Dudley (Incorporated by reference to Exhibit 10.1 to the Registrant's Current Report on Form 8-K, filed on January 16, 2024).
10.10#	Employment Agreement, dated as of March 24, 2021, by and Between TransCode Therapeutics, Inc. and Thomas A. Fitzgerald (Incorporated by reference to Exhibit 10.11 to the Registrant's Amendment No. 2 to Registration Statement on Form S-1, filed on April 8, 2021 (File No. 333-253599)).
10.11#	Letter Agreement, dated as of March 24, 2021, by and Between TransCode Therapeutics, Inc. and Thomas A. Fitzgerald (Incorporated by reference to Exhibit 10.12 to the Registrant's Amendment No. 2 to Registration Statement on Form S-1, filed on April 8, 2021 (File No. 333-253599)).
10.12	Form of Securities Purchase Agreement (Incorporated by reference to Exhibit 10.1 to the Registrant's Current Report on Form 8-K, filed on December 2, 2024) .
10.13	Form of Registration Rights Agreement (Incorporated by reference to Exhibit 10.2 to the Registrant's Current Report on Form 8-K, filed on December 2, 2024)
23.1*	Consent of Withum Smith+Brown, PC, independent registered public accounting firm.
23.2*	Consent of Goodwin Procter LLP (included in Exhibit 5.1).
24.1	Power of Attorney (included on signature page).
104	Cover Page Interactive Data File (formatted as Inline XBRL and contained in Exhibit 101)
107*	Filing Fee Table.

# Indicates a management contract or any compensatory plan, contract or arrangement.

* Filed herewith.

† Portions of this exhibit (indicated by asterisks) were omitted in accordance with the rules of the Securities and Exchange Commission.

(b) Financial Statements Schedules: None.

Item 17. Undertakings

The undersigned registrant hereby undertakes:

(a)(1) To file, during any period in which offers or sales are being made, a post-effective amendment to this registration statement:

(i) To include any prospectus required by Section 10(a)(3) of the Securities Act of 1933, as amended (the "Securities Act");

(ii) To reflect in the prospectus any facts or events arising after the effective date of the registration statement (or the most recent post-effective amendment thereof) which, individually or in the aggregate, represent a fundamental change in the information set forth in the registration statement. Notwithstanding the foregoing, any increase or decrease in the volume of securities

offered (if the total dollar value of securities offered would not exceed that which was registered) and any deviation from the low or high end of the estimated maximum offering range may be reflected in the form of prospectus filed with the Commission pursuant to Rule 424(b) if, in the aggregate, the changes in volume and price represent no more than 20% change in the maximum aggregate offering price set forth in the "Calculation of Registration Fee" table in the effective registration statement; and

(iii) To include any material information with respect to the plan of distribution not previously disclosed in the registration statement or any material change to such information in the registration statement;

provided, however, that paragraphs (1)(i), (1)(ii) and (1)(iii) do not apply if the information required to be included in a post-effective amendment by those paragraphs is contained in reports filed with or furnished to the Commission by the registrant pursuant to Section 13 or Section 15(d) of the Securities Exchange Act of 1934, as amended (the "Exchange Act"), that are incorporated by reference in the registration statement, or is contained in a form of prospectus filed pursuant to Rule 424(b) that is part of the registration statement.

(2) That, for the purposes of determining any liability under the Securities Act, each such post-effective amendment shall be deemed to be a new registration statement relating to the securities offered therein, and the offering of such securities at the time shall be deemed to be the initial bona fide offering thereof.

(3) To remove from registration by means of a post-effective amendment any of the securities being registered which remain unsold at the termination of the offering.

(4) That, for the purpose of determining liability of the registrant under the Securities Act to any purchaser in the initial distribution of the securities, the undersigned registrant undertakes that in a primary offering of securities of the undersigned registrant pursuant to this registration statement, regardless of the underwriting method used to sell the securities to the purchaser, if the securities are offered or sold to such purchaser by means of any of the following communications, the undersigned registrant will be a seller to the purchaser and will be considered to offer or sell such securities to such purchaser:

(i) Any preliminary prospectus or prospectus of the undersigned registrant relating to the offering required to be filed pursuant to Rule 424;

(ii) Any free writing prospectus relating to the offering prepared by or on behalf of the undersigned registrant or used or referred to by the undersigned registrant;

(iii) The portion of any other free writing prospectus relating to the offering containing material information about the undersigned registrant or its securities provided by or on behalf of the undersigned registrant; and

(iv) Any other communication that is an offer in the offering made by the undersigned registrant to the purchaser.

(5) That, for purposes of determining any liability under the Securities Act:

(i) the information omitted from the form of prospectus filed as part of the registration statement in reliance upon Rule 430A and contained in the form of prospectus filed by the Registrant pursuant to Rule 424(b)(1) or (4) or 497(h) under the Securities Act shall be deemed to be part of the registration statement as of the time it was declared effective; and

(ii) each post-effective amendment that contains a form of prospectus shall be deemed to be a

new registration statement relating to the securities offered therein, and the offering of such securities at that time shall be deemed to be the initial bona fide offering thereof.

(b) The undersigned registrant hereby undertakes that, for purposes of determining any liability under the Securities Act, each filing of the registrant's annual report pursuant to Section 13(a) or 15(d) of the Exchange Act (and, where applicable, each filing of an employee benefit plan's annual report pursuant to Section 15(d) of the Exchange Act) that is incorporated by reference in the registration statement shall be deemed to be a new registration statement relating to the securities offered therein, and the offering of such securities at that time shall be deemed to be the initial bona fide offering thereof.

(c) Insofar as indemnification for liabilities arising under the Securities Act may be permitted to directors, officers and controlling persons of the registrant pursuant to the indemnification provisions described herein, or otherwise, the registrant has been advised that in the opinion of the SEC such indemnification is against public policy as expressed in the Securities Act and is, therefore, unenforceable. In the event that a claim for indemnification against such liabilities (other than the payment by the registrant of expenses incurred or paid by a director, officer or controlling person of the registrant in the successful defense of any action, suit or proceeding) is asserted by such director, officer or controlling person in connection with the securities being registered, the registrant will, unless in the opinion of its counsel the matter has been settled by controlling precedent, submit to a court of appropriate jurisdiction the question whether such indemnification by it is against public policy as expressed in the Securities Act and will be governed by the final adjudication of such issue.

Signatures

Pursuant to the requirements of the Securities Act of 1933, the registrant has duly caused this Registration Statement to be signed on its behalf by the undersigned, thereunto duly authorized, in the City of Boston, Commonwealth of Massachusetts, on the 6th day of December 2024.

TRANSCODE THERAPEUTICS, INC.

By: /s/ Thomas A. Fitzgerald

Thomas A. Fitzgerald
Interim Chief Executive Officer

Power of Attorney

Each individual whose signature appears below hereby constitutes and appoints Thomas A. Fitzgerald as such person's true and lawful attorney-in-fact and agent with full power of substitution and re-substitution, for such person in such person's name, place and stead, in any and all capacities, to sign any and all amendments (including post-effective amendments) to this Registration Statement (or any Registration Statement for the same offering that is to be effective upon filing pursuant to Rule 462(b) under the Securities Act of 1933), and to file the same, with all exhibits thereto, and all documents in connection therewith, with the Securities and Exchange Commission granting unto each said attorney-in-fact and agent full power and authority to do and perform each and every act and thing requisite and necessary to be done in and about the premises, as fully to all intents and purposes as such person might or could do in person, hereby ratifying and confirming all that any said attorney-in-fact and agent, or any substitute or substitutes of any of them, may lawfully do or cause to be done by virtue hereof.

Pursuant to the requirements of the Securities Act of 1933, as amended, this Registration Statement and Power of Attorney has been signed by the following person in the capacities and on the date indicated.

Name	Title	Date
/s/ Thomas A. Fitzgerald Thomas A. Fitzgerald	*Director, Interim Chief Executive Officer and Chief Financial Officer (Principal Executive, Financial and Accounting Officer)*	December 6, 2024
/s/ Philippe P. Calais Philippe P. Calais, PhD	*Director*	December 6, 2024
/s/ Erik Manting Erik Manting, PhD	*Director*	December 6, 2024
/s/ Magda Marquet Magda Marquet, PhD	*Director*	December 6, 2024

Exhibit 5.1

Goodwin Procter LLP
100 Northern Avenue
Boston, MA 02210

December 6, 2024

TransCode Therapeutics, Inc.
6 Liberty Square, #2382
Boston, MA 02109

Re: Securities Registered under Registration Statement on Form S-1

Ladies and Gentlemen:

We have acted as counsel to you in connection with your filing of a Registration Statement on Form S-1 (as amended or supplemented, the "Registration Statement"), with the Securities and Exchange Commission pursuant to the Securities Act of 1933, as amended (the "Securities Act"), relating to the registration by TransCode Therapeutics, Inc., a Delaware corporation (the "Company"), of the offer and sale from time to time by the selling stockholders listed in the Registration Statement under "The Selling Stockholders" (the "Selling Stockholders") of, (i) 173,033 shares of the Company's common stock, par value $0.0001 per share, ("Common Stock") issued in a private placement of the Company's securities (the "PIPE Shares"), (ii) 470,007 shares of Common Stock (the "PIPE PFW Shares") issuable upon exercise of pre-funded warrants to purchase Common Stock (the "PIPE PFWs"), (iii) up to 4,050,951 shares of Common Stock (the "Series C Common Warrant Shares") issuable upon exercise of warrants to purchase Common Stock (the "Series C Common Warrants") and (iv) up to 12,152,853 shares of Common Stock (the "Series D Common Warrant Shares" and together with the Series C Common Warrant Shares, the "Common Warrant Shares"; the Common Warrant Shares together with the PIPE PFW Shares, the "Warrant Shares") issuable upon exercise of warrants to purchase Common Stock (the "Series D Common Warrants" and together with the Series C Common Warrants, the "Common Warrants"; the Common Warrants together with the PIPE PFWs, the "Warrants"); sold to the Selling Stockholders and certain of their affiliates pursuant to the stock purchase agreement dated as of November 26, 2024, (the "PIPE SPA") by and among the Company and the Selling Stockholders.

We have reviewed such documents and made such examination of law as we have deemed appropriate to give the opinions set forth below. We have relied, without independent verification, on certificates of public officials and, as to matters of fact material to the opinions set forth below, on certificates of officers of the Company. For purposes of the opinions set forth in numbered paragraph 2, we have assumed that before the Warrant Shares are issued, the Company does not issue shares of Common Stock or reduce the total number of shares of Common Stock that the Company is authorized to issue under its certificate of incorporation such that the number of unissued shares of Common Stock authorized under the Company's certificate of incorporation is less than the number of the Warrant Shares.

The opinion set forth below is limited to the Delaware General Corporation Law.

Based on the foregoing, we are of the opinion that:

1. The PIPE Shares have been duly authorized and validly issued and are fully paid and non-assessable.

2. The Selling Stockholder Warrant Shares have been duly authorized and, when issued upon exercise of the Warrants as applicable, in accordance with the terms of the Warrants, will be validly issued, fully paid and nonassessable.

Our opinions set forth above are subject to bankruptcy, insolvency, fraudulent transfer, reorganization, moratorium and other similar laws of general application affecting the rights and remedies of creditors and to general principles of equity.

This opinion letter and the opinions it contains shall be interpreted in accordance with the Core Opinion Principles as published in 74 Business Lawyer 815 (Summer 2019).

We hereby consent to the inclusion of this opinion as Exhibit 5.1 to the Registration Statement and to the references to our firm under the caption "Legal Matters" in the Registration Statement. In giving our consent, we do not admit that we are in the category of persons whose consent is required under Section 7 of the Securities Act or the rules and regulations thereunder.

Very truly yours,

/s/ GOODWIN PROCTER LLP

GOODWIN PROCTER LLP

Exhibit 23.1

CONSENT OF INDEPENDENT REGISTERED PUBLIC ACCOUNTING FIRM

We hereby consent to the incorporation by reference in the Prospectus constituting a part of this Registration Statement on Form S-1, of our report dated April 1, 2024, (which includes an explanatory paragraph relating to Transcode Therapeutics, Inc.'s ability to continue as a going concern), relating to the financial statements of Transcode Therapeutics, Inc. as of and for the years ended December 31, 2023 and 2022 appearing in the entity's Annual Report on Form 10-K for the year ended December 31, 2023. We also consent to the reference to us under the caption "Experts" in the Prospectus.

/s/ WithumSmith+Brown, PC.

East Brunswick, New Jersey
December 6, 2024

Exhibit 107

Calculation of Filing Fee Tables

S-1
(Form Type)

TransCode Therapeutics, Inc.
(Exact Name of Registrant as Specified in its Charter)

Table 1: Newly Registered and Carry Forward Securities

	Security Type	Security Class Title	Fee Calculation or Carry Forward Rule	Amount Registered	Proposed Maximum Offering Price Per Share	Maximum Aggregate Offering Price[1]	Fee Rate	Amount of Registration Fee
Fees to be Paid	Equity	Common stock, $0.0001 par value per share	457(g)	—	—	$ 2,152,704	0.00015310	$ 329.58
Fees to be Paid	Equity	Common stock underlying the Pre-Funded Warrants	457(g)	—	—	5,847,357	$ 0.00015310	$ 895.23
Fees to be Paid	Equity	Common stock underlying the Series C Warrants[2]	457(g)	—	—	$ 10,079,576	$ 0.00015310	$ 1,543.18
Fees to be Paid	Equity	Common stock underlying the Series D Warrants[3]	457(g)	—	—	$ 30,238,729	$ 0.00015310	$ 4,629.55
Fees Previously Paid	—	—	—	—	—	—	—	$ —
Carry Forward Securities	—	—	—	—	—	—	—	—
	Total Offering Amounts					$ 48,318,366		$ 7,397.54
	Total Fees Previously Paid							—
	Total Fee Offset							—
	Net Fee Due							$ 7,397.54

(1)Pursuant to Rule 416, the securities being registered hereunder include such indeterminate number of additional securities as may be issued after the date hereof as a result of stock splits, stock dividends or similar transactions.
(2)The maximum aggregate offering price of the Series C Warrants were calculated using the Floor Price per warrant.
(3)The maximum aggregate offering price of the Series D Warrants were calculated using the Floor Price per warrant.