UNITED STATES SECURITIES AND EXCHANGE COMMISSION
Washington, D.C. 20549

FORM 6-K

REPORT OF FOREIGN PRIVATE ISSUER PURSUANT TO RULE 13a-16 OR 15d-16 UNDER THE SECURITIES EXCHANGE ACT OF 1934

For the Month of April 2018

Commission File Number: 001-38217

Nightstar Therapeutics plc

(Translation of registrant's name into English)

---

215 Euston Road
London NW1 2BE United Kingdom
(Address of principal executive office)

Indicate by check mark whether the registrant files or will file annual reports under cover of Form 20-F or Form 40-F:
☒ Form 20-F ☐ Form 40-F

Indicate by check mark if the registrant is submitting the Form 6-K in paper as permitted by Regulation S-T Rule 101(b)(1): ☐

Indicate by check mark if the registrant is submitting the Form 6-K in paper as permitted by Regulation S-T Rule 101(b)(7): ☐

EXHIBIT LIST

Exhibit	Description
99.1	Press Release dated April 3, 2018.

SIGNATURES

Pursuant to the requirements of the Securities Exchange Act of 1934, the registrant has duly caused this report to be signed on its behalf by the undersigned, thereunto duly authorized.

NIGHTSTAR THERAPEUTICS PLC

Date: April 3, 2018

By: /s/ Bryan Yoon
Name: Bryan Yoon
Title: General Counsel

Exhibit 99.1

Nightstar Therapeutics Reports 2017 Financial Results and Business Highlights

- Recent initiation of STAR phase 3 trial in Choroideremia -
- Begins 2018 with a cash position over $129 million -

LEXINGTON, Mass. and LONDON – April 3, 2018 (GLOBE NEWSWIRE) – Nightstar Therapeutics plc (NASDAQ: NITE), a clinical-stage gene therapy company developing treatments for rare inherited retinal diseases, today reported financial results for the year ended December 31, 2017 and provided an update on recent corporate and clinical highlights.

"2017 was an exceptional year for the company," said Dave Fellows, Chief Executive Officer. "We set the stage for the recent initiation of the first-ever Phase 3 trial in choroideremia and today announced further data supporting the durability of the treatment effect for NSR-REP1 in choroideremia. Elsewhere in our pipeline, we initiated our Phase 1/2 gene therapy trial for X-linked retinitis pigmentosa and in-licensed our program for Stargardt disease. We also raised more than $130 million of gross proceeds from our successful Series C financing and IPO to continue our pioneering research and development activities."

Business Highlights Include

- **Initiated First-Ever Phase 3 Trial for Choroideremia (NSR-REP1).** The STAR Phase 3 registrational trial is expected to enroll approximately 140 patients across 18 clinical sites in the United States, Europe, Canada and South America, of which six sites will be surgical centers. Eligible patients will be randomized into one of three study arms: 56 patients receiving a high-dose of NSR-REP1 in one-eye; 28 patients receiving a low-dose of NSR-REP1 in one-eye; and 56 patients receiving no treatment (no-sham, parallel control arm). The primary endpoint of the STAR trial is the proportion of patients with an improvement of at least 15 ETDRS letters from baseline in visual acuity at 12 months post-treatment. The primary endpoint will compare patients in the high-dose treatment arm with patients in the control arm. We anticipate that the STAR trial will be fully enrolled by the first half of 2019.
- **NSR-REP1 Data Supporting the Durability of Treatment Effect to Be Presented at ARVO 2018 (NSR-REP1).** After two years of follow-up in the Oxford Trial, the median visual acuity (n=14) improved by 4.5 letters in the treated eyes compared with a loss of 1.5 letters in the untreated eyes. At the last follow up (ranging from two to five years), visual acuity had been maintained or had increased in all 12 treatment eyes that received gene therapy as per protocol, compared to four of the 12 untreated eyes. (link to abstract)
- **Natural History Data Increases Understanding of 2.5x Greater Risk of Untreated Disease Progression in Choroideremia.** Preliminary top-line data from the NIGHT natural history observational study at 20 months follow-up (the final time point in the NIGHT study) indicated that 22% of choroideremia eyes experienced a loss in visual acuity of five or more ETDRS letters, compared to less than 8% for patients treated with the high-dose of NSR-REP1. This data further supports the importance of developing new treatments for choroideremia to reverse or maintain the loss of visual acuity due to the natural progression of disease.

- **Initiated Phase 1/2 Gene Therapy Clinical Trial for X-Linked Retinitis Pigmentosa (XLRP).** Our second retinal gene therapy product candidate, NSR-RPGR, is in a dose-ranging Phase 1/2 clinical trial for the treatment of XLRP in the United Kingdom and United States. We are evaluating multiple doses and have completed dosing of the first few cohorts of three patients each. We expect the initial data on safety and tolerability from the dose escalation cohorts of this trial to be available towards the end of 2018; this data will determine the dose for study in an expansion cohort anticipated to include up to 30 patients.
- **Expanded Inherited Retinal Disease Pipeline with Novel Gene Therapy for the Treatment of Stargardt Disease.** We recently in-licensed NSR-ABCA4 for the treatment of Stargardt disease, utilizing a novel technology developed by the University of Oxford. Preclinical proof-of-concept studies in the Abca4-/- murine model of Stargardt disease have demonstrated the expression, localization and function of the ABCA4 protein. Stargardt disease is the most common form of inherited juvenile macular dystrophy with a prevalence of one in 10,000 people. There are no treatments currently available for Stargardt disease. This program will leverage Nightstar's capabilities, physician relationships and clinical experience with NSR-REP1 and NSR-RPGR.

Financial Results

Research and development expenses for the year ended December 31, 2017 were $20.5 million versus $10.2 million for the year ended December 31, 2016. The increase of $10.3 million resulted from increases in program-related expenses of $3.4 million for NSR-REP1, and $1.5 million for NSR-RPGR, as well as a $1.9 million increase in personnel-related costs, and a $1.3 million expense to reduce research and development tax relief claims receivable from HM Revenue & Customs in the United Kingdom. Research and development personnel costs increased due to additional employees hired in 2017 to support our growing company and to assist in the further development of our product candidates and pipeline. This increase in research and development personnel-related costs includes $0.5 million of additional non-cash stock-based compensation compared to 2016.

General and administrative expenses for the year ended December 31, 2017 were $7.0 million, compared to $2.1 million for the year ended December 31, 2016. The increase of $4.9 million is mainly due to a $2.1 million increase in consulting and professional fees, including increased legal, accounting and audit fees associated with our corporate reorganization and non-capitalizable costs incurred in connection with our IPO, and a $1.8 million increase in personnel-related costs. General and administrative personnel costs increased to support our increased research and development activities and our status as a public company. This increase in general and administrative personnel-related costs includes $0.7 million of additional non-cash stock-based compensation compared to 2016.

Net loss for the year ended December 31, 2017 was $29.7 million, or ($1.63) basic and diluted net loss per ordinary share, as compared to $12.2 million for the year ended December 31, 2016, or ($1.36) basic and diluted net loss per ordinary share.

As of December 31, 2017, our cash and cash equivalents totaled $129.4 million, compared to $10.1 million at December 31, 2016. In October 2017, we sold 6,164,000 American Depositary Shares (representing the same number of ordinary shares), including the full exercise by the

underwriters of their option to purchase additional ADSs, at $14.00 per ADS in our IPO for net proceeds of approximately $77.4 million. In June 2017, we completed a $45 million Series C financing with Syncona, NEA, Wellington and Redmile. As of December 31, 2017, we had 28.9 million ordinary shares outstanding.

Upcoming Conference Participation

Nightstar will participate in the Bloomberg Biotech Innovations Conference on Monday, April 9th, 2018 at 3:30pm ET in New York City. Additional information is available at http://b.bloomberg.com/reg-BiotechInnovations. The link to the live audio webcast and replay of the presentation will be available through Bloomberg terminals at Live <go>.

About Nightstar

Nightstar is a leading clinical-stage gene therapy company focused on developing and commercializing novel one-time treatments for patients suffering from rare inherited retinal diseases that would otherwise progress to blindness. Nightstar's lead product candidate, NSR-REP1, is currently in Phase 3 development for the treatment of patients with choroideremia, a rare, degenerative, genetic retinal disorder that has no current treatments and affects approximately one in every 50,000 people. Positive results from a Phase 1/2 trial of NSR-REP1 were published in The Lancet in 2014 and in The New England Journal of Medicine in 2016. Nightstar's second product candidate, NSR-RPGR, is currently being evaluated in a Phase 1/2 clinical trial for the treatment of patients with X-linked retinitis pigmentosa, an inherited X-linked recessive retinal disease that affects approximately one in every 40,000 people.

For more information about Nightstar or its clinical trials, please visit www.nightstartx.com.

Cautionary Language Concerning Forward-Looking Statements

This press release contains "forward-looking statements" within the meaning of the Private Securities Litigation Reform Act of 1995. The words "believe," "anticipate," "intend," "estimate," "will," "may," "should," "expect" or other similar expressions are intended to identify forward-looking statements, although not all forward-looking statements contain these identifying words. All statements contained in this press release other than statements of historical facts are forward-looking statements, including, without limitation: statements about our results of operations for the full-year 2017, cash position and sufficiency of capital resources to fund our operating requirements, our planned clinical trials for NSR-REP1 and NSR-RPGR, including our STAR Phase 3 trial in choroideremia and the expansion of future clinical trials, the continued clinical development of our pipeline, the timelines associated with our research and development programs including the timing of patient enrollment and the release data from ongoing clinical trials and studies, the prevalence of patient populations for our targeted indications, and the utility of prior preclinical and clinical data in determining future clinical results. These forward-looking statements are based on management's current expectations of future events and are subject to a number of involve substantial known and unknown risks, uncertainties and other factors that may cause our actual results, levels of activity, performance

or achievements to be materially different from the information expressed or implied by these forward-looking statements, including the risks and uncertainties set forth in the "Risk Factors" section of our prospectus filed pursuant to Rule 424(b)(4) under the U.S. Securities Act of 1933, as amended, on September 28, 2017, and subsequent reports that we file with the U.S. Securities and Exchange Commission. We may not actually achieve the plans, intentions, estimates or expectations disclosed in our forward-looking statements, and you should not place undue reliance on our forward-looking statements. Actual results or events could differ materially from the plans, intentions, estimates and expectations disclosed in the forward-looking statements we make. We anticipate that subsequent events and developments will cause our views to change. We are under no duty to update any of these forward-looking statements after the date of this press release to conform these statements to actual results or revised expectations, except as required by law. You should, therefore, not rely on these forward-looking statements as representing our views as of any date subsequent to the date of this press release.

###

Investors:
Senthil Sundaram, Chief Financial Officer
Brian Luque, Sr. Manager, Investor Relations
investors@nightstartx.com

Media:
Alicia Davis, THRUST IR
910-620-3302
alicia@thrustir.com

NIGHTSTAR THERAPEUTICS PLC

Consolidated Statements of Operations and Comprehensive Loss
(In thousands, except share and per share amounts)

	Year Ended December 31,	
	2017	2016
Operating expenses:		
Research and development	$ 20,502	$ 10,165
General and administrative	7,001	2,055
Total operating expenses	27,503	12,220
Other income (expense):		
Interest and other income	709	22
Other expense, net	(2,855)	—
Total other income (expense), net	(2,146)	22
Loss before provision for income taxes	(29,649)	(12,198)
Provision for income taxes	37	—
Net loss	(29,686)	(12,198)
Other comprehensive loss:		
Foreign exchange translation adjustment	3,988	(1,385)
Total comprehensive loss	$ (25,698)	$ (13,583)
Basic and diluted net loss per ordinary share	$ (1.63)	$ (1.36)
Weighted average basic and diluted ordinary shares	18,186,752	8,954,388

NIGHTSTAR THERAPEUTICS PLC

Consolidated Balance Sheets
(In thousands)

	December 31,	
	2017	2016
Assets		
Current assets:		
Cash and cash equivalents	$129,404	$10,122
Prepaid expenses and other assets	5,438	4,110
Total current assets	134,842	14,232
Property and equipment, net	355	363
Total assets	$135,197	$14,595
Liabilities and shareholders' equity		
Current liabilities:		
Accounts payable	$ 3,196	$ 1,229
Accrued expenses and other liabilities	6,189	4,322
Total current liabilities	9,385	5,551
Total liabilities	9,385	5,551
Total shareholders' equity	125,812	9,044
Total liabilities and shareholders' equity	$135,197	$14,595