



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

DIVISION OF  
CORPORATION FINANCE

Mail Stop 4720

December 23, 2015

Via E-mail

Keith M. Gottesdiener, M.D.  
Chief Executive Officer  
Rhythm Pharmaceuticals, Inc.  
855 Boylston Street  
11<sup>th</sup> Floor  
Boston, MA 02116

**Re: Rhythm Pharmaceuticals, Inc.  
Amendment No. 1 to  
Draft Registration Statement on Form S-1  
Submitted December 9, 2015  
CIK No. 0001649904**

Dear Dr. Gottesdiener:

We have reviewed your amended draft registration statement and have the following comments. In some of our comments, we may ask you to provide us with information so we may better understand your disclosure.

Please respond to this letter by providing the requested information and either submitting an amended draft registration statement or publicly filing your registration statement on EDGAR. If you do not believe our comments apply to your facts and circumstances or do not believe an amendment is appropriate, please tell us why in your response.

After reviewing the information you provide in response to these comments and your amended draft registration statement or filed registration statement, we may have additional comments.

Prospectus Summary  
Overview, page 1

1. We note your response to prior comment 3. In each page you reference in your response, please amend your disclosure to explicitly state that only two patients are currently enrolled and receiving treatment in the clinical trial.

Business  
General

2. We note your response to prior comment 16, in which you discuss your efforts to statistically model the possible patient population. As requested, please discuss whether management believes that the estimates are statistically valid. Also, please expand this section to discuss any further efforts you have undertaken to assess the potential number of patients that might be impacted by MC4 pathway deficiency.

Overview, page 79

3. We note your response to prior comment 17. Please amend your disclosure to include the information you have supplementally provided in your response, as it directly addresses our comment.

Notes to Financial Statements  
Preferred Stock, page F-15

4. Please tell us why you believe the classification of your Series A Convertible Preferred Stock within Stockholder's Equity is appropriate. Refer to ASC 480-10-S99-3A.3.f.

You may contact James Peklenk at (202) 551-3661 or Joel Parker, Accounting Branch Chief, at (202) 551-3651 if you have questions regarding comments on the financial statements and related matters. Please contact Scot Foley at (202) 551-3383, Christian Windsor, Special Counsel, at (202) 551-3419 or me at (202) 551-3675 with any other questions.

Sincerely,

/s/ Christian Windsor  
Special Counsel  
FOR

Suzanne Hayes  
Assistant Director  
Office of Healthcare and Insurance

cc: Julio E. Vega  
Laurie A. Cerveney  
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One Federal Street  
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