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CONGENITAL HEART DISEASE

VIEWPOINT

Use of Historical Cricket Scorecards to Accurately Map Effort Tolerance in Untreated Congenital Heart Disease

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ABSTRACT

This case report describes rare accurate historical documentation of progressive reduction in effort tolerance over time in a patient with untreated congenital heart disease and pulmonary hypertension. (JACC Case Rep. 2025;30:102802)
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On September 14, 1916, Sir James Mackenzie diagnosed Arnold Bax (later to be knighted for services to music) with a hemodynamically significant ventricular-septal defect. At the time of the examination, Bax was 33 years of age. On examination, Sir James found a "displaced apex beat" and a low-pitched rumbling murmur heard loudest at the "base of the heart." Sir James noted frequent ectopics in Bax's pulse and breathlessness on "slight exertion." Based on these findings, Sir James declared Bax unfit for military service.[1]

Records of Bax's life provide anecdotal documentation of his progression into Eisenmenger syndrome.[1]

Bax died in October 1953 profoundly cyanosed. Four years before his death, a first-hand account describes his "shuffling walk, physical frailty, facial discoloration and shortness of breath."

Sir James was the first physician to write about the importance of exercise tolerance in assessing a patient's response to illness, cardiac or otherwise. Sir James was placed in charge of differentiating between servicemen with murmurs who were fit or unfit

TAKE-HOME MESSAGES

- This is the first documented case of the use of accurate historical sporting data to map change in effort capacity over time in untreated congenital heart disease.
- This remarkable dataset provides a unique insight into the real-world experience of living with untreated progressive pulmonary arterial hypertension and correlates with modern patient testimonies.
- Assessment of a patient with pulmonary arterial hypertension remains a clinical process integrating examination findings and objective data but ultimately remaining focused on exercise tolerance including the 6-minute walk test.
- This case is a remarkable testimony to Sir James's startling observation that the most accurate progression or recovery data will always hinge on the patient's lived experience of their condition reflected in their overall exercise capacity.

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The author attests they are in compliance with human studies committees and animal welfare regulations of the author's institution and Food and Drug Administration guidelines, including patient consent where appropriate. For more information, visit the Author Center.

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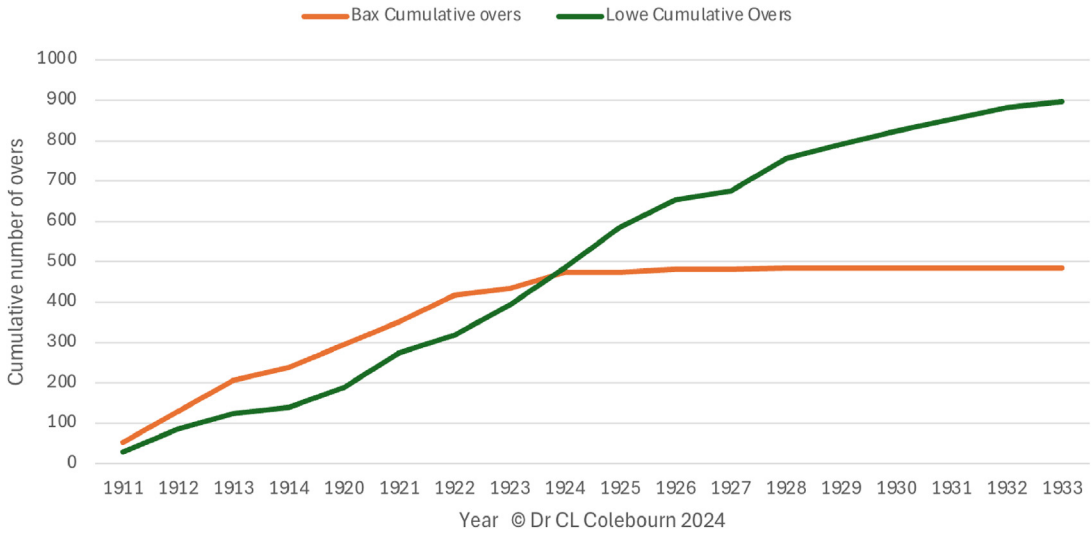
FIGURE 1 Cumulative Number of Overs Bowled Per Season: A. Bax vs R. Lowe, 1911 to 1933



for military service. He differentiated between these 2 groups through assessment of their exercise capacity. This landmark observation underpins the NYHA functional class of exercise capacity.[2]

In most cases of historical diagnosis, accurate clinical examination findings and corroboration of exercise tolerance are absent. Uniquely, in this instance, we can access both: first through Sir James's examination report and second because Bax grew up playing cricket with his brother and their tutor.

In 1911, Sir Arnold's brother Clifford set up a cricket team which played a week long series of matches annually from 1911 to 1933. The Old Broughtonians played a total of 139 games over 22 years. Clifford, a writer by profession, published 5 volumes of meticulous notes recording the cricket weeks in scorecard detail.

Since Bax's cardiac diagnosis was fully appreciated in 2022, the 5 volumes have been reunited as a set in the library of the Marylebone Cricket Club by the author. The volumes precisely detail the contribution made by each player to each match.[3]

The 4 active components of cricket are bowling the ball, swinging the bat, catching or chasing the ball, and shuttle runs over a distance of 20 m between the stumps. These activities can be defined metabolically as moderate activity.[4]

In patients with pulmonary arterial hypertension, the vital right ventricular response to the onset of exercise is absent. Immediate increase in mean pulmonary arterial pressure on exercise, coupled with maladapted tachycardia prevents delivery of increased venous return from exercising muscle to the left ventricle. The patient is forced to stop exercising by breathlessness and presyncope.[5]

Bax played on the team predominantly as a bowler from 1911 to 1933. This is also the case for another player, RH Lowe. Both men bowled consistently on the team between these dates. Lowe therefore provides us with a set of control data against which we can examine Bax's change in exercise tolerance over time.

The cumulative number of overs (6 balls) that Bax bowled per season from 1911 to 1933 tells a striking story. These data are shown in **Figure 1** and are plotted against Lowe to show the point of divergence.

The data show the moment at which Bax ceases to maintain his work rate which had previously been superior to that of Lowe.

Given our knowledge of Bax's examination in 1916, we can make a pathophysiological link between his cardiac structure and function and his abrupt change in effort tolerance from 1922 onward.

The pathophysiology of uncorrected ventricular-septal defect is the development of pulmonary arterial hypertension followed by progressive right to left shunting. We can therefore reasonably conclude that from 1922 onward, Bax was suffering from pulmonary

arterial hypertension to a degree which was incompatible with short bursts of moderate activity.

We must also consider that these data could simply be a reflection of a reduction in Bax's participation due to another illness or injury. Analysis of the full dataset does not support this position. The data show that Bax attended and participated in every season to 1933. The annual reports make no mention of injury or illness precluding his participation.[3]

The detailed scorecards show that as Bax's bowling rate falls, he instead participates periodically as a batsman. Bax scored only 390 runs between 1911 and 1932. By comparison, Lowe scored 1455 runs over that time period. Bax's highest batting score in a match was achieved pre-1917 when he scored 22 runs in a single match. His batting average over his Broughtonian career was very low at 6.3 runs per match. Bax was also a limited fielder, making 11 catches in his career in comparison to 53 catches made by Lowe.[3]

If Bax had continued to bowl at his original work rate as shown in **Figure 1**, he would have achieved a projected career total of 275 wickets eclipsing Lowe's record. He actually achieved only 113 due to the abrupt fall off in his work rate from 1922.

In 1932, The Old Broughtonians sent out a team of 11 men onto the field; they were accompanied by Sir Arnold who was effectively the twelfth man. Sir Arnold opened the batting with his brother Clifford, staying on the field for just a short time. This was a farewell match celebrating his career and friendship with the team. Sir Arnold scored just 6 runs in that match and was never documented as playing again.[3]

The Old Broughtonian team played for just one further season and Sir Arnold did not play at all that year. Instead, Sir Arnold accompanied the team on tour keeping score. Sir Arnold wrote the penultimate match report for his team who played against Melksham on August 12, 1933.[3]

When Sir Arnold Bax died on October 3, 1953, he remained on the waiting list for membership of the Marylebone Cricket Club, testimony to his lifelong love for cricket.

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