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Contribution ID: 189

Type: 3 - Talk

## 12-Weeks of Precision Exercise Reduces Frailty by Increasing Fitness in Chronic Lymphocytic Leukaemia: A Randomised Controlled Trial

Thursday 23 July 2026 15:15 (15 minutes)

**Purpose:** Chronic lymphocytic leukaemia (CLL), whether treatment-naïve (TN) or being treated (TRE), increases frailty risk. Underlying this is an abnormal reduction in aerobic fitness and strength. Previous exercise studies have failed to improve aerobic fitness, likely due to their generalised approach. We aimed to evaluate the impact of a 12-week precision exercise intervention in adults with CLL.

**Methods:** 63 adults with CLL [39M/24F: aged  $66.5 \pm 8.3$  years] were enrolled and 58 completed a prospective RCT assessing a 12-week exercise program designed to target exercise limitations. Consisting of 3 x nonlinear cardiovascular and 2 x resistance sessions/week (~150 mins/week), patients were supervised in person (N=14 SUP), semi-supervised remotely (N=29 REM), or no exercise (N=15 CON). Baseline and 12-week assessments included aerobic capacity ( $VO_{2peak}$ ), muscle strength, physical function and frailty. Results are presented as mean absolute change  $\pm$  SD.

**Results:** At baseline, TN (N=35) and TRE (N=28) had comparable physiological and frailty profiles and were combined. Significant time $\times$ group interactions were observed for changes in Fried frailty phenotype scores ( $p=0.012$ ,  $\eta^2=.179$ ). Reductions in frailty for SUP ( $-0.36 \pm 0.50$  units,  $p=0.013$ ) and REM ( $-0.12 \pm 0.43$  units,  $p=0.061$ ) were superior to CON ( $0.08 \pm 0.49$  units). Underlying this were time $\times$ group interactions for  $VO_{2peak}$  with superior changes for SUP ( $2.8 \pm 3.1$  mL/kg/min,  $p=0.007$ ) and REM ( $2.2 \pm 2.3$  mL/kg/min,  $p=0.002$ ) compared to CON ( $-0.5 \pm 2.6$  mL/kg/min). Time $\times$ group interactions were also observed for chest press ( $p<0.001$ ,  $\eta^2=.266$ ), seated row ( $p=0.002$ ,  $\eta^2=.226$ ) and leg press ( $p<0.001$ ,  $\eta^2=.423$ ). No main effects were observed for changes in other physical function assessments.

**Conclusion:** For the first time, we show that 12 weeks of precision exercise personalised to individuals' exercise limitations reduces frailty and improves aerobic fitness and strength in patients with CLL. These findings support integrating precision, targeted exercises into routine CLL care to reduce frailty risk and enhance functional independence

### Keywords

Frailty,  
Chronic Lymphocytic Leukaemia,  
Exercise Intervention,  
Cancer,

### Conflict of Interest & Ethical Approval

yes

### Abstract submitters declaration

yes

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**Session Classification:** Oral Session