a linear system approach. Such approach has not been successful in explaining and/or predicting RRI satisfactorily.

Objectives To develop and validate an artificial intelligence (AI) algorithm in order to identify RRI risk profiles in recreational runners.

Design Mathematical model.

Settings São Paulo, Brazil.

Participants 191 recreational runners.

Assessment of Risk Factors This was a 3-step AI study using data from a prospective cohort study. In step 1, variable selection and exploratory analyses were conducted in the original (n=191) and simulated data (n=5000). In step 2, the AI algorithm was developed using self-organising maps, k-means and probabilistic neural networks. The algorithm was trained in 80% (n=4000) of the simulated data, and validated using the remaining 20% (n=1000). Characterisation of RRI risk profiles was performed in step 3.

Main Outcome Measures RRI risk profiles were established based on the groups created by the developed algorithm. Descriptive analyses were performed to summarise the risk profiles.

Results The variables with greatest influence in the algorithm were: sex; running intensity; history of RRIs; and current musculoskeletal discomfort related to running. Five groups were suggested by the algorithm. Male runners reporting previous RRIs and running in low-to-moderate intensities (>6 min/km) were at the highest risk of RRIs. Male runners reporting previous RRIs and running in high intensities (3 to 5 min/km) in about 32.1% of the time were at the lowest risk of RRIs. The classification accuracy of the algorithm presented a median of 99.6% (interquartile range: 99.5% to 99.8%).

Conclusions A non-linear system approach using AI and machine learning techniques were successful in developing an RRI risk profile algorithm for recreational runners.

068

ENVIRONMENTAL FACTORS, TRAINING FACTORS, RACE PACE AND DISTANCE, OLDER AGE, AND METABOLIC/ENDOCRINE DISEASE ARE INDEPENDENT RISK FACTORS ASSOCIATED WITH ADVERSE EVENTS IN RUNNERS: A SAFER STUDY IN 76654 STARTERS

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Background Pre-race medical screening at endurance events has recently been suggested, but there are limited data on the use of pre-race questionnaire data to predict adverse events (defined as medical encounters or not finishing a race).

Objective To determine if risk factors, that are identified from a pre-race medical screening questionnaire, are associated with adverse events during a distance running event.

Design Prospective study, with cross-sectional analyses.

Setting 2012–2015 Two Oceans marathon races (21.1 km, 56 km), South Africa.

Patients (or Participants) 76654 race entrants (21.1 km and 56 km race).

Interventions (or Assessment of Risk Factors) Upon entering the race, all entrants completed a pre-race medical screening questionnaire. Based on the responses to the questionnaire, runners received a targeted educational intervention to reduce medical encounters (ME). All individual race day data was collected, and this included AE data as follows: runners that did-not-finish (DNF) the race (collected from the race organisers), and runners who had a medical encounter (ME) (collected by race day medical staff).

Main Outcome Measurements Using a multiple regression model, we report the prevalence ratio (PR: 95% CI) of risk factors associated with the adverse event rate (AE) (defined as DNF or ME), using race day data and individual pre-race medical screening data.

Results Independent risk factors associated with AE in the Two Oceans Races were: males >45years (1.2: 1.0–1.3; p=0.0210), females >55years (1.5: 1.1–2.1; p=0.0051), slower training pace (increase of 1min/km, 1.2: 1.1–1.2; p<0.0001), increased training frequency per week (increase of 2 times/week, 1.2: 1.1–1.3; p=0.0017), and a history of metabolic/endocrine disease (1.6: 1.2–2.1; p=0.0006).

Conclusions Environmental and training factors, older age, race pace and distance, and history of metabolic/endocrine disease were independent risk factors associated with adverse events in a mass-participation distance running event. These factors could be considered when developing and implementing pre-race education material that is disseminated to participants prior to the event.

069

SELF-REPORTED MEDICAL CONDITIONS/MEDICATION USE, OLDER FEMALES, AND SLOW PACE ARE INDEPENDENT RISK FACTORS FOR ALL MEDICAL ENCOUNTERS IN A 90 KM ULTRAMARATHON: A SAFER STUDY IN 70328 RUNNERS OVER 5 YEARS

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Background There is a high incidence of medical encounters (MEs) in ultramarathon road running races but risk factors associated with MEs in events have not been well investigated.

Objective To determine the independent risk factors for all medical encounters in a 90km ultramarathon running race.

Design Retrospective clinical audit, cross-sectional analysis

Setting 2014–2018 Comrades ultramarathon (90 km, alternating annually between an 'up' vs. a 'down' run between a coastal and inland city), South Africa

Participants 70328 race starters

Interventions All participants voluntarily completed two medical-related questions (history of allergies and/or a medical condition/or use medication) upon entry for the event. Race day data, including 'up' vs. 'down' run, start time, finish time, age and sex of starters, was recorded by the race organisers. MEs were recorded by medical staff during and immediately after the event.

Main Outcome Measures Independent risk factors associated with all MEs (both injury- and illness-related) using race day factors and individual self-reported medical history (allergies and medical conditions/medication use) were investigated using a multivariate model with a Poisson distribution, reporting the prevalence ratio (PR: 95% CI).

Results Over 5 years 1 749 medical encounters were recorded. Independent risk factors associated with all MEs were: older females (males 31–40 years vs females >50 years, 0.6: 0.4–0.8, $p=0.0017$; males 41–50 years vs females >50 years, 0.5: 0.4–0.7, $p=0.0002$; males >50 years vs females >50 years, 0.6: 0.4–0.8, $p=0.0008$), slower race pace (7–<8 min/km vs 8–<9 min/km, 0.8: 0.7–0.9; $p=0.0044$) and self-reported medical conditions/medication use (no history vs. medical condition/medication use, 0.7: 0.6–0.9; $p=0.0082$).

Conclusion A self-reported history of a medical condition/medication, older females, and slower runners were risk factors associated with MEs during/immediately after the 90km Comrades ultramarathon. These data support initiatives to introduce pre-race medical screening, which could then form the basis for the design and implementation of prevention programs to manage risk of MEs at these events.

070

METABOLIC/ENDOCRINE DISEASE, OLDER FEMALES, LONGER RACE DISTANCE, SLOWER RACE PACE AND HIGHER WBGT ARE INDEPENDENT RISK FACTORS ASSOCIATED WITH MEDICAL ENCOUNTERS IN 21.1 KM AND 56 KM RUNNERS: A SAFER STUDY IN 76654 STARTERS

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Background Recent data indicate that pre-race medical screening and education can reduce medical encounters (MEs) at an endurance running event. However, the relationship between the risk of MEs and specific risk factors from pre-race medical screening, together with race day factors, and has not been explored.

Objective To determine the independent risk factors that are associated with MEs during distance running events, using data from pre-race medical screening and race day.

Design Prospective study, with cross-sectional analyses.

Setting 2012–2015 Two Oceans marathon races (21.1km, 56km), South Africa.

Patients (or Participants) 76654 consenting race entrants.

Interventions (or Assessment of Risk Factors) All entrants completed a pre-race medical screening questionnaire upon entry, coupled with an educational intervention, as per their responses to questions. Race day data were collected from the race organisers and all MEs were recorded by medical staff on race day.

Main Outcome Measurements Risk factors associated with ME (both injury- and illness-related) were investigated

using a multiple regression model with a Poisson distribution (reporting the prevalence ratio - PR: 95% CI) that included: demographics (age, sex), race day data [wet-bulb globe temperature (WBGT), race distance (21.1km or 56km), race pace], and individual pre-race medical screening data.

Results Independent risk factors associated with MEs were: history of metabolic disease (2.1: 1.3–3.3; $p=0.0030$), older females (>55 years) (2.5: 1.6–4.1; $p=0.0002$), longer race distance (56km vs. 21.1km, 1.9: 1.5–2.4; $p<0.0001$), slower race pace (increase of 1min/km, 1.2: 1.1–1.3; $p=0.0029$), and higher WBGT ($p=0.0264$).

Conclusions Metabolic/endocrine disease, older females, longer race distance, slower race pace and higher WBGT were independent risk factors for MEs in distance running events. In addition to environmental factors, these data support initiatives to obtain pre-race medical screening, demographic, and running pace data in order to design and implement ME prevention programs at distance running events.

071

SLOWER RUNNERS, OLDER FEMALES AND ROUTE CHARACTERISTICS ARE INDEPENDENT RISK FACTORS FOR SERIOUS/LIFE-THREATENING MEDICAL ENCOUNTERS IN A 90 KM ULTRAMARATHON: A SAFER STUDY IN 70328 RUNNERS OVER 5 YEARS

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Background Serious/life-threatening medical encounters (sltMEs) occur during mass community-based events, with higher incidences in ultra-endurance events. Risk factors associated with sltMEs are under-investigated.

Objective To determine independent risk factors for serious/life-threatening MEs in a 90 km ultramarathon running event.

Design Retrospective clinical audit, cross-sectional analysis

Setting 2014–2018 Comrades ultramarathon (90km, alternating annually between an ‘up’ vs. a ‘down’ run between a coastal and inland city), South Africa

Participants 70328 race starters

Interventions All entrants voluntarily completed two medically-related questions: 1) history of allergies, and 2) history of any medical condition and/or medication use. Race day data (start time, finish time, age, sex, ‘up’ vs. ‘down’ run) was recorded by the race organisers; and sltMEs (as defined in the 2019 consensus statement on mass community-based events) were recorded by race medical staff during and immediately after the event.

Main Outcome Measures Independent risk factors associated with sltMEs (injury- and illness-related) using demographics (age, sex), race day factors (route ‘up’ or ‘down’; race pace), and individual self-reported medical history (allergies, medical conditions/medication use) were investigated using a multivariate model with a Poisson distribution, reporting the prevalence ratio (PR: 95% CI).

Results 159 serious/life-threatening medical encounters were recorded over the 5 years. The following independent risk factors were associated with serious/life-threatening medical encounters: age and sex (males 31–40 yrs vs females >50 yrs, 0.3: 0.1–0.7, $p=0.0076$; males 41–50 yrs vs females >50 yrs,