

THE CHANGING LANDSCAPE OF FOOTBALL MEDICINE

ADVANCES AND CHALLENGES OVER 30 YEARS AT ONE ENGLISH PREMIER LEAGUE CLUB

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Football can be volatile and unstable. The average tenure for a manager in the English Premier League is 14.5 months¹. While traditionally, medical teams have been more stable and generally less likely to be affected by managerial changes (unlike fitness and performance staff), times are changing. Almost half of the 20 current English Premier League teams changed either their first team doctor or lead physiotherapist in the last 3 years. The impact of constant changes can affect the medical staff's ability to create a stable environment and take care of player welfare, where trusting relationships with players are key.

Knowledge and familiarity with each player's individual strengths and weaknesses are integral when making specific recommendations or suggesting interventions to make improvements. Key

staff changes and consequent challenges in communication, changes to training and playing styles are important factors that can increase the risk of injury in elite football players². Stability is beneficial for teams on both a sporting and economic level³. The challenge that football (and football medicine) faces is how to maintain a certain level of stability while being committed to innovation and improvement. In the quest for higher performance, elite football teams are constantly progressing, incorporating advances in technical staff, medical staff, fitness coaches, rehabilitation specialists, nutritionists, psychologists, data-analysts and statisticians, to name but a few⁴.

We have been leaders of the medical department of one of the most stable teams in the big 5 European leagues (English Premier League, La Liga, Serie

A, Ligue 1, Bundesliga)⁵ for more than 30 years. Throughout this time, we have seen and been actively involved in major aspects of the evolution of this club and various innovations. One of the first elite football epidemiology studies came from our club, written by the lead author of this article, Gary Lewin⁶. Along with the various advances, we have also seen and experienced a number of challenges in our clinical practice, which have helped us progress and, at times, hindered us.

The aim of this article is to provide a unique insight into a 30-year period at an English Premier League club from the view of football medicine. Throughout the article we make specific reference to key messages highlighted in Gary Lewin's 1989 article (based on injury data from the 1987 season) and relate these to the modern game, in

TABLE 1: AN OVERVIEW OF VARIOUS FOOTBALL- AND FOOTBALL-MEDICINE-RELATED ASPECTS FROM 1987 AND 2017.

What	1987	2017
Squad size (number of players)	1st team 20/Reserve 20/Youth 20	1st team 28/Academy (U23 and 18), 40/Women's team with own staff
Number of 'medical' support staff	1 physiotherapist, 2 part-time doctors	1st team – 4 physiotherapists, 3-4 masseurs, 1 full-time doctor, 1 full-time medical administrator
Other support staff (roles/positions)	None	4 strength & conditioning/performance staff PLUS consultants – osteopath, psychologist, nutritionist, podiatrist, yoga instructor, Research & Development, radiologists
Typical match schedule	Saturday to Saturday. Occasional mid-week except Christmas, New Year, Easter or cup replays	TV schedules dictate. Typically, 1 match every 3-4 days with the occasional free mid-week replays
European football	None	Every year since 1998 – 6-8 games minimum
Number of matches during season	54	55
Travel schedules (most extreme)	None	Pre-season tours in Australia, China, USA west coast, with matches within 72 hours of landing
International breaks	None. All matches were Wednesdays with squad meet-up the preceding Sunday	3-4 per year for 10 days each time. 75-80% of squad involved and games all around the world, returning sometimes less than 48 hours before next league game. Africa Nations Cup (January), Confederations Cup, U21 Euros, FIFA World Cup, UEFA Euro Championship during summer
Christmas break?	No break. Always 4 matches in 10 days (26th and 27th Dec, 1st & 2nd Jan)	No break. 4 games in approximately 10 days – no matches on consecutive days
Number of internationals per year	During season: 5; end of season: 3-7 depending if tournament year	Excluding tournaments, 9-10 per year, sometimes mid-June
Number of international players in the squad	7-9 but only home countries (i.e. England, Scotland, Wales, Northern Ireland, Republic of Ireland)	Approximately 75% of squad currently, playing for 11-12 different countries on three continents
Nationalities of players	All British/Irish	17 nationalities at its most diverse, currently 11
Anti-doping control	1-2 maximum per season, on match days	Regular doping control throughout the season; each player tested on average 5 times per season
Most common injuries	Muscle injuries (n = 17) (hamstring n = 5) and ankle injuries (n = 16), squad of 20	Muscle injuries (n = 22) (hamstring n = 9), ankle injuries (n = 5), squad of 28
Medical diagnostic tools	Clinical examination or X-ray	Clinical, but over-reliant on MRI. Ultrasound use growing, CT and single-photon emission computed tomography also used. Ultrasound tissue characterisation for tendons emerging
Technology (all)	Radio isotope bone scan, paper medical notes	Global Positioning Satellite Systems (GPS) & heart-rate technology, TRACAB video match analysis, electronic medical record, NordBord, jump mats, force plates, isokinetic dynamometry, dual-energy X-ray absorptiometry
Recovery methods	Post-match social (including a beer or two), 1 to 2 days off following the match/massage. A team walk replaced recovery training	Cold water immersion, cryotherapy chamber, masseurs, nutrition supplements, skins/socks, NormaTec, pools, Firefly, education on sleep/nutrition
Media pressure/exposure	Limited exposure. Very few live matches	Huge media exposure and rise of social media. Multitude of dedicated sports channels, radio shows, websites, blogs, international partners, live television worldwide. Combined 60 million followers on Arsenal FC Instagram/Facebook/Twitter.
Communication	Easy to communicate. Only 4 full-time staff for the first team; medical and coaching. For all teams, 8 full-time staff, no mobile phone, no email	Harder due to increased staff numbers. Mobile phones and email help, but the art of conversation at risk of dying as people's time becomes more precious and pressured. With increased staff comes increased number of opinions
Pitch quality	All grass but poor quality. Poor drainage and not sand based	World-class most of the time for games and training
Artificial pitches	Some match pitches were old astro turf pitches (concrete base!)	Extremely rare, possible in an away cup tie
Facilities	Small medical room (2 treatment beds), electrotherapy and physiotherapist manual work	Bigger medical room, far less electrotherapy, now have pools, cryochambers, rehab areas, 2 gyms, 11 pitches (see Figure 1)
Stadium	Highbury Stadium (Figure 2) – capacity 38,419, from 1913 to 2006	Emirates Stadium (Figure 3) – capacity 60,432, from 2006 to present
Typical training content	All football work, circuit training or running around pitch and up and down the terraces. Same training for everyone.	Field-based, gym-based, individualised sessions 1-2 per week depending on schedule. Recovery is now (easy) football drills with the ball, on pitch
Physical demands of the game	No definitive research to our knowledge, but clearly less intense than now	High-intensity actions and sprinting metrics have significantly increased in this decade alone
Training and match monitoring	No structured monitoring protocol. Match minutes would be noted but mainly subjective opinion from staff on how tired a player looked	Tracking of match and training minutes, session rating of perceived exertion (RPE), wellness, GPS, heart rate, video tracking system for matches (TRACAB)
Recovery monitoring	Same as with training and match monitoring	Wellness, sleep, hamstring force, countermovement jump, adductor squeeze

particular how they have impacted and/or hindered our clinical practice. We focus on three key aspects, but you will find a comprehensive overview of ‘then (1987) versus now (2017)’ in Table 1. While many of these aspects alone could easily justify an entire article, we provide brief insights into each one.

“The objective of my paper in 1989 was to highlight the common injuries in football with a view to working with coaches to start preventative measures and guide future research” – Gary Lewin, 15th October, 2017.

ADVANCE & CHALLENGE 1: THE EVOLUTION OF FOOTBALL MEDICINE SUPPORT STRATEGIES

In 2017 there are a multitude of strategies available to us that help support our clinical practice. In 1987, this was not the case. While there are many areas that have emerged, we have decided to focus on three specific areas that have affected our clinical practice from 1987 to 2017.

Radiological advances

Thirty years ago there was almost no dependence on radiological investigations. The clinical opinion of the doctor/physiotherapist/orthopaedic specialist was definitive. Now, as scanning technology and relationships with radiologists have developed, almost all injuries will have an objective investigation of some description. The question is, have we actually become too reliant on this technology? There can be no doubting that an MRI/ultrasound/CT interpreted by skilled, experienced radiologists can aid our diagnosis and prognosis. The expectation from players, agents and staff that the ‘scan’ will provide everything we need to know has grown enormously and was not the case in 1987. In 2017, elite players rarely rely on clinical opinion alone and will expect or even demand a scan—even for the most innocuous issue. This may lead to ‘overdiagnosis’. The balance, likely lies somewhere in the middle.

Monitoring/screening protocols

Substantial advances have been made in the area of screening and monitoring, explaining our implementation of these in our practice. In 1987, formal screening extended as far as the new player medical.



Figure 1: Arsenal FC Training Complex, London, UK.

Figure 2: Highbury Stadium, capacity – 38,419, from 1913 to 2006.

Figure 3: Emirates Stadium, capacity – 60,432, from 2006 to present.



This involved radiological checks, alongside an orthopaedic consultation and physiotherapy assessment of a usually fit player. 'In-season' screening was almost non-existent. Monitoring was largely subjective, not too dissimilar to the more formal Profile of Mood States (POMS) questions we use today. In 2017, we use an extensive battery of tests to provide the medical and performance staff with in-depth knowledge of all areas of the player's ability to perform well and safely. Pre-season screening days are common and include a multitude of technologies and procedures including but not limited to: DEXA scanning, concussion baselines, blood tests, cardiac screens, physiotherapy assessments, eye tests, respiratory function screens, psychological tests and various neuromuscular tests for strength/power. In-season monitoring consisting of daily POMS, speed/strength tests, repeat blood tests, recovery markers and external load monitoring using GPS during training provides us with a wealth of data. The need to analyse and manage these data goes some way to explaining

the growth in support staff (outlined later in this article). We have a responsibility to ensure we are using these data efficiently to allow a better understanding of the players and, where possible, an individualisation of their training or recovery sessions.

The advent of these technologies in football has been gradual. Each year another new technology is developed and we are often alerted to the next 'holy grail'. While it would be easy to just ignore the constant sales pitches, we have to remain diligent and assess each technological development on its merits. To determine which are useful and which are more likely to be 'snake-oil', we employ a decision-making tool, accounting for research evidence, expert opinion and considered judgement to help decide whether or not we should buy or employ a specific technology or technique. In summary, the advances in screening and monitoring have helped us to better understand our players. However, we must be conscious not to use more than is necessary⁷. As Professor Aaron Coutts reminds us often: "keep it simple".

Recovery strategies

In 1987, Arsenal FC was not in European competition. In the 2017/18 season, we expect to play 55 to 60 games, including pre-season, Premier League, domestic cups and European competition. The 2017/18 squad is larger than in 1987 (28 versus 20), but the efforts of many staff are directed at ensuring the players recover as quickly as possible, so that they are able to train/play again – often within 3 to 4 days. Recovery strategies are an integral part of our work⁸. In 1987, the recovery strategies employed were a lot 'simpler' than today: days off, massage and a beer after the match to bring the group together were the recovery strategies of choice. Some may find it surprising but actually, in 1987 the number of games played was almost identical (54). The league had 22 teams and two good cup runs brought the tally to only one less game than the 55 played in 2017. One could argue that as there were no lengthy 10-day international breaks and that the games were better spaced out, the argument of 'there are more games nowadays' does not

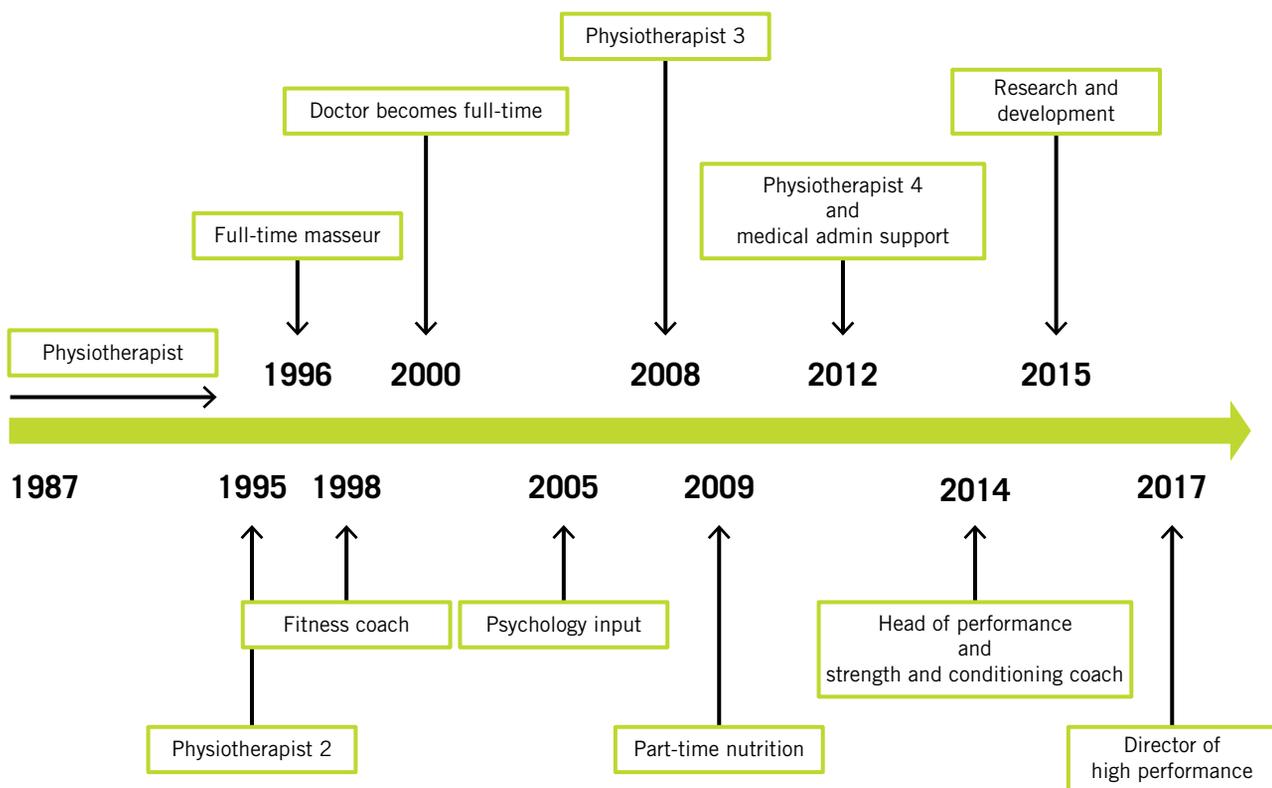


Figure 4: 30-year timeline of staff additions in the Arsenal FC 1st team.



hold true in our comparison. However, in 2017, with dramatic increases in high-speed distances/sprint distances etc., the exertion is far greater. Every opportunity to enhance recovery is explored, especially during periods with multiple matches: compression socks, nutrition advice, sleep science, cry-chambers, cold water immersion, full-time massage therapists and other modalities are all made available to the squads.

ADVANCE & CHALLENGE 2: INTEGRATING NEW DISCIPLINES

Over the past 30 years we have seen substantial growth in the number of new disciplines involved with the squads, including: fitness & conditioning, sport

science, nutrition, psychology, match analysis and research & development. In 1987, many of these functions were performed by the physiotherapist. Figure 4 provides a timeline of the past 30 years, highlighting the introduction of key disciplines.

The support staff at Arsenal, along with every other club, has grown enormously. In 1987 the support staff around the manager was a coach and a physiotherapist. The number of staff now directly supporting the first team is easily five times that number. Figures 5 and 6 show the Arsenal team photos from 1987 and 2017, and go some way to demonstrating the growth in this area. There are, in fact, many staff members

who support the team who are not even in the 2017 photo!

While the increase in expertise is vital and welcome, it does bring some challenges. Communication needs to be efficient to avoid mixed messages. Managers are required, so job titles including Head of Performance, Head of Medical, Performance Director, and Head of Science & Medicine are becoming the norm in professional football. In 2017, our club appointed a Director of High Performance, to streamline communication, reporting and decision-making with the medical team and other departments. In 1987, the manager would really only speak with the physiotherapist or part-time doctor about the medical well-being of a



Figure 5: The first team squad photograph in 1987.

Figure 6: The first team squad photograph in 2017.

Figure 7: Gary Lewin (far right) celebrating the 1987 League Cup win.

Figure 8: Colin Lewin (back row central) celebrating the 2017 FA Cup win.



player. Now the manager has input from all disciplines. Although this means more information is available, it can also cloud judgement – effective communication and people management skills are vital.

ADVANCE & CHALLENGE 3: THE MULTI-NATIONAL DRESSING ROOM

In 1987, the Arsenal squad was composed of all British and Irish players. In 2017, as is the case with most elite teams, the dressing room is very much multi-national and more than 75% of the players represent their countries (adding another 8 to 10 games a year to players' workload). A variety of nationalities bring with it an ever-changing and fascinating atmosphere with many

different languages, cultures, religions, personal and football experiences. While all clubs are no doubt searching for the 'best' regardless of passport, having a multi-national squad can also bring some key challenges to the medical team.

Establishing a rapport with the players is vital when working with them on a daily basis. Building trust, especially during a rehabilitation process, is extremely important. Cultural beliefs around health and medicine can make this difficult and it is an on-going process of learning and adaptation. Occasional language barriers and the understandable wish to get an opinion from medical practitioners (e.g. doctor, physiotherapist, orthopaedic sur-

geon) in the player's home country can also add to the confusion. For example, an international player who has spent his early career in his native country and playing for his national team from a very young age will likely have a rapport and trust with his national team doctor. A request to involve this doctor in any big decisions around injury management needs to be embraced. Rejecting this request could easily result in anxiety and doubt on the player's side, would probably upset his family and agent and, if we are honest, will probably happen anyway without our knowledge. A big decision, such as surgery, should be made with the player completely behind the choice and feeling sure he has been listened to and looked after.

Liaising with the numerous international medical teams when it comes to international qualifiers/tournaments is also something that needs to be handled carefully. It requires understanding on both sides and often a great deal of compromise. In 1987, these conversations were with British and Irish national teams, in the same language, on the same time-zone and were necessary much less frequently. In 2017 (and beyond), communication, organisation, understanding and openness are key for the medical practitioner.

'Plus ça change, plus c'est la même chose'

'The more things change, the more they stay the same' is a proverb by French novelist, Jean-Baptiste Alphonse Karr⁹ and is a well-studied phenomenon in many industries. It highlights that while many things can change, core aspects generally remain the same.

There have been many significant



changes and evolutions in professional football and football medicine. However, there are some essential aspects that remain constant. Here are some examples:

1. **Injuries are our greatest concern.** Despite clear efforts and advances in player care, muscle injuries are still a major issue for the football medicine practitioner. We also have to consider that the game is getting more and more intense – in some cases $\geq 50\%$ more high speed running and sprinting¹⁰. So while this problem remains, our efforts in practice and research may actually be helping to slow the rise in injury numbers.
2. **Prevention is better than cure.** The objective of football medicine practitioners everywhere is the same: to prevent injuries or perhaps more suitable, this should probably read ‘reduce’ injuries. If an injury happens, we aim to help the player return to football as quickly and safely as possible.
3. **The win metric trumps all others.** The pressure to win matches is still the key outcome that we are all ultimately held to account over and what many decisions are ultimately made on.
4. **Scientifically sound technology and innovation is always welcome.** We are still seeking ways to improve and progress. But we need to be conscious that we spend our time and money on innovations that have good scientific underpinning and not buy into snake-oil.

Finally and most importantly, the Arsenal team remains successful and continues to win trophies (Figures 7 and 8). Many of the comparisons in this article make football



Figure 9: Arsenal FC players running along the A1 Motorway.

Figure 10: Arsenal FC physiotherapist leading the warm-up in the early 1970s.

“ **Stability is beneficial for teams on both a sporting and economic level³. The challenge that football (and football medicine) faces is how to maintain a certain level of stability while being committed to innovation and improvement** ”

in 2017 appear unrecognisable from how it was in 1987. However, the medical goals remain essentially unchanged, despite the ever-changing environment in which we work. A 30-year follow-up to this article, in 2047, would certainly make for interesting reading. We have added some additional photographs that we think will be of interest to the reader – while Figures 9 and 10 are clearly not from the 1980s but rather the early 70s, we think they illustrate well how common the main principles in football are (e.g. the importance of well-developed physical qualities), but also just how far we have evolved.

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