

Fit for the fight? Illnesses in the Norwegian team in the Vancouver Olympic Games

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ABSTRACT

Background The development of strategies to prevent illnesses before and during Olympic Games provides a basis for improved health and Olympic results.

Objective (1) To document the efficacy of a prevention programme on illness in a national Olympic team before and during the 2010 Vancouver Olympic Winter Games (OWG), (2) to compare the illness incidence in the Norwegian team with Norwegian incidence data during the Turin 2006 OWG and (3) to compare the illness incidence in the Norwegian team with illness rates of other nations in the Vancouver OWG.

Methods Information on prevention measures of illnesses in the Norwegian Olympic team was based on interviews with the Chief Medical Officer (CMO) and the Chief Nutrition and Sport Psychology Officers, and on a review of CMO reports before and after the 2010 OWG. The prevalence data on illness were obtained from the daily reports on injuries and illness to the International Olympic Committee.

Results The illness rate was 5.1% (five of 99 athletes) compared with 17.3% (13 out of 75 athletes) in Turin ($p=0.008$). A total of four athletes missed one competition during the Vancouver Games owing to illness, compared with eight in Turin. The average illness rate for all nations in the Vancouver OWG was 7.2%.

Conclusions Although no definite cause-and-effect link between the implementation of preventive measures and the prevalence of illness in the 2010 OWG could be established, the reduced illness rate compared with the 2006 OWG, and the low prevalence of illnesses compared with other nations in the Vancouver OWG suggest that the preparations were effective.

INTRODUCTION

Participating and competing in the Olympic Games is an experience for the very few and may happen just once in a lifetime. Athletes and coaches work diligently on physical, technical and mental factors that can add an extra edge to the performance level during these games. Nevertheless, illnesses may interrupt these preparations and, in the worst case, put an end to the participation in the Olympic Games that the athlete has planned for several years. It is therefore of paramount importance for the athletes to avoid illnesses and injuries during these critical weeks around the Games.

Within the last decade, the International Olympic Committee (IOC) and the Olympic local organising committees (OGOCs) have increasingly emphasised the protection of athletes' health. In the Beijing 2008 Olympic Summer Games, the IOC carried out a study in which the

frequency, characteristics and causes of injuries incurred during the Games (training and competition) were analysed.^{1–2} In the Vancouver 2010 Olympic Winter Games (OWG), the IOC also included illness in their surveillance study.^{3–4}

Several studies on the incidence of injuries have been carried out in single summer sport tournaments, such as football,^{5–11} volleyball,¹² beach volleyball,¹³ handball,¹⁴ tennis,¹⁵ cycling,¹⁶ swimming¹⁷ and athletics.¹⁸ A few single winter sport injury studies have also been carried out.^{19–22} However, limited data on the incidence of illness have been generated from multisport events, and the few surveys that exist have included only summer events. The data have been categorised by sports, but not by national teams, except for South Africa.^{23–24} Furthermore, apart from swimming,¹⁷ and one study during the Commonwealth Games,²⁵ incidence studies on illness in single sport tournaments or multisport events are to our knowledge non-existent.

Since 1992, Norway has consistently been among the best nations in Winter Olympics. The exception was the 2006 Olympics in Turin, where Norway won only two gold medals, finishing thirteenth in the final gold medal count. Illnesses and health-related factors were considered to be a major reason for this underperformance of the Norwegian team.²⁶ Because of this unfortunate experience in Turin, the Olympic Top Sports Program (hereafter Olympiatoppen) came up with a clear objective of reducing illnesses among the athletes in the period leading up to and through the OWG in Vancouver 2010.²⁷

Measures to achieve this objective of minimising the effect of illness on performances in the 2010 OWG were stated in a document by the CMO of the Norwegian team about 18 months prior to the Games and read as follows: ‘

(A) to select a medical team with the highest level of competence and an optimal blend of expertise in sports medicine, nutrition and psychology; (B) to provide high-quality expertise on assessment and treatment of illness and injuries, as well as nutritional and psychological issues related to performance; (C) to identify individual needs for the prevention of specific illnesses, injuries and maladaptation to training; (D) to implement practical measures to prevent illnesses and achieve optimal health and performance for each athlete; (E) to inform and educate the medical/support staff as well as the athletes in each sports team on issues related to illness prevention; and (F) to assess

particular environmental and medical challenges related to health and performance at the various Olympic venues.²⁷

The present investigation had three objectives: (1) to observe and describe how the Norwegian medical team worked to prevent illness before and during the 2010 Vancouver OWG; (2) to prospectively collect data on illness during the Vancouver OWG; and (3) to compare the illness data from the Vancouver OWG with the data from the 2006 Turin OWG. The main aim of the study was to evaluate whether the new measures taken to prevent illnesses before and during the 2010 OWG would contribute a lower incidence of illness in the Vancouver OWG compared with the previous Games in Turin.

METHODS

The present investigation is a nation-specific study of the Norwegian Olympic Team for the 2010 Vancouver OWG and builds on observations as well as data collection in the Norwegian team during the previous OWG in Turin 2006.

Subject characteristics

Norway participated in Vancouver with 99 athletes (25 females, 74 males), 25 more athletes than in Turin 2006, mainly because of the male ice hockey team that qualified for the Vancouver OWG. The 99 athletes were divided into 11 sports. Twenty-six of the athletes (nine female, 17 male) had competed in the 2006 Turin OWG as well (table 1). A total of 101 officials were accredited by the IOC, a group which included support personnel in the different teams, such as head coaches and ski-waxers (68), the leader group (3), press attachés (5), coaches from Olympiatoppen (4), administration/transport (2) and the health team (20). In addition, the Norwegian team consisted of unaccredited personnel, including members of the health team (6) and chefs (2). Ice-hockey (23 athletes) and cross-country skiing (19 athletes) had the largest squads. A majority of the athletes and their support personnel stayed in the two Olympic Villages in Whistler Mountains and Vancouver, but two teams (alpine skiing and biathlon) were located in private houses rented by Olympiatoppen.

Medical team personnel

The Norwegian medical team of 26 people included physicians, physiotherapists, physiologists, nutritionists, sport psychologists and one masseur (table 2).

Table 1 Number of athletes in the Norwegian Olympic team participating in the Vancouver 2010 and Turin 2006 Olympic Winter Games

	Female athletes (participated in 2006)	Male athletes (participated in 2006)
Total no of athletes*	25 (9)	75 (17)
Alpine	1 (0)	5 (3)
Biathlon	5 (2)	6 (3)
Cross-country skiing	8 (3)	11 (4)
Curling	–	5 (1)
Freestyle	4 (0)	2 (0)
Ice-hockey	–	23 (0)
Nordic combine	–	5 (2)
Skeleton	1 (1)	–
Ski jumping	–	5 (1)
Snowboard	4 (2)	6 (1)
Speed skating	2 (1)	7 (2)

*One athlete was enrolled in two sports (biathlon and cross-country skiing).

Data collection

Information on strategies to prevent illness in the Norwegian Olympic team was based on observations and interviews with the Chief Medical Officer (CMO), the Chief Nutrition Officer, the Chief Sport Psychology Officer as well as reviews of documents and reports from the CMO.²⁷ Prevalence and incidence data on illness occurrence during the OWG were based on two sources: (1) daily reports on injuries and illnesses from the CMO of the Norwegian team to the IOC, in accordance with the 'Injury & Illness Prevention Study';⁴ and (2) medical logs from the individual team physicians on treatment and consequences of each injury/illness as well as the CMO's health report after the 2010 OWG.²⁸ These data were used to cross-check with the IOC reports.⁴ When comparing the incidence of illness between the Vancouver 2010 and the Turin 2006 OWG, we also took into account the composition of the Norwegian Olympic teams at the two occasions.

Definitions of illness

We used the same definitions as the IOC medical commission where an illness was defined as any complaint and/or symptom newly incurred and that received medical attention regardless of the consequences with respect to absence from 'competition and/or training'.²⁹ The definitions used the following inclusion criteria: (A) all illness that received medical attention (not only those resulting in time-loss); (B) newly incurred (pre-existing and chronic illnesses should not be reported unless the athlete suffers an acute episode) and (C) during the period of the Olympic Games (12–28 February 2010). Injuries should be incurred in competition or training.

Intervention measures to prevent illnesses

a. During the last year of preparations for the Vancouver OWG, the medical team personnel worked with each of the sports teams to develop and implement guidelines on how to prevent illnesses in the sports teams. The following strategies and measures were used²⁶: Distribute specific guidelines on illness prevention and immediate response strategies to newly incurred illnesses in a team. A fact sheet was written by the CMO on each of these issues based on expert knowledge and 'best practice' experience. This was posted on the website and distributed to each of the teams by the designated medical personnel.

Table 2 Norway in the 2010 Vancouver Olympic Winter Games compared with the 2006 Turin Olympic Winter Games

	Turin 2006	Vancouver 2010
General		
Total no of athletes	74	99
Athletes living in Olympic Villages	40	82
Athletes living outside the Olympic Villages	35	17
No of accredited officials	75	101
Total no of medals	19	23
Gold medals	2	9
No in the medal statistics	13	4
Health		
No of physicians	6	7
Physiotherapists	9	10
Physiologists	1	2
Sport psychologists	1	4
Nutritionists	–	2
Masseurs	–	1

- b. Team medical personnel informed all team members about the guidelines in a meeting during training camp and monitored the implementation of these guidelines during their work as team physicians and physiotherapist throughout the preparation phase.
- c. Screening tests on allergies, asthma and other airway problems were offered to all candidates for the Vancouver Olympic team and were performed as part of a large multicentre study in 10 different countries. The tests were carried out both in our laboratory facility and in the different practice fields. The same expert personnel did the follow-up test of athletes with airway problems, and a mobile test unit was used in Vancouver/Whistler.
- d. An extensive vaccination programme for athletes, coaches and support staff against the H1N1flu, seasonal flu and pertussis/whooping cough was carried out, both at our Olympic Sports Center and with ambulatory personnel during team training camps.
- e. Athletes with a heavy competition load and susceptibility to respiratory-tract infections and airway problems were accommodated for the most part in single rooms during the pre-Olympic competition period as well as during Vancouver OWG to minimise the risk of exposure to contagious diseases and exacerbations of asthma and allergy.
- f. Specific measures regarding the widespread use of disinfectant hand gels, use of plastic to cover carpeted hotel rooms, use of special indoor air cleaning systems, routines of minimised hand shaking and close contact with people outside the team including fans and the media were strongly advocated by the team medical personnel.

RESULTS

Compliance with the intervention measures

More than 90% of the athletes opted to take the flu vaccine (H1N1) and/or the additional vaccines mentioned above. Eighty per cent of the athletes chose to enter the screening study on allergies, asthma and other airway problems. Individual counselling on personal routines for preventing infectious diseases was performed in the pre-season screening exams. This was done in accordance with a standardised checklist of items to be covered by the team physicians. A total of 90% of athletes participating in the Vancouver OWG had this examination during the preparation period. With regard to the other illness-prevention measures, we do not have a quantitative estimate of compliance, but our observations indicate that the vast majority of the Olympic athletes kept to the guidelines and preventive measures both before and during the 2010 OWG.

Frequency and characteristics of illness in Vancouver

A summary of illnesses suffered during the period of reporting (11–29 February) is provided in table 3. There were five cases of illness affecting five athletes corresponding to an incidence of 5.1 illnesses per 100 athletes. Four out of the five illnesses

affected the respiratory system. Three cases were diagnosed as pharyngitis or ‘common colds,’ one as a mild enteritis and one diagnosed as having mononucleosis 2 days into the Olympic period. In the last case, the illness must have been contracted during the weeks prior to arrival in Vancouver, since the incubation period for this virus normally is 3–6 weeks. All cases occurred among athletes living in the Olympic Villages. For sports such as alpine skiing, biathlon, curling, freestyle and skeleton, no illness was reported.

Comparisons of illness in Turin versus Vancouver and with other nations in Vancouver

In Turin, eight athletes in a team of 74 were unable to compete in one or more competitions owing to illness, while another five were probably affected by illness when they competed (table 4). Thus, a significantly higher illness incidence of 17.3% (13 out of 74 athletes) was observed in Turin compared with an illness rate of 5.1% in Vancouver ($\chi^2=6.94$, $p=0.008$).

For all nations participating in the Vancouver OWG, the reported 185 illnesses resulted in an incidence of 72.1 illnesses per 1000 registered athletes.

DISCUSSION

The Norwegian team in the Vancouver OWG had less than a third of the incidence of illness (5.1%) compared with the Turin OWG (17.3%)³⁰ and a considerably lower rate compared with the average in Vancouver.⁴ In contrast to Turin OWG where a total of six of the expected medal candidates were affected, only one of the major medal candidates in the Norwegian Vancouver team was affected by illness. The results presented in this study suggest that the new preventive measures taken before and during the 2010 OWG most likely contributed to a lower incidence of illness in the Vancouver OWG compared with the previous Games in Turin.²⁷ However, whether or not fewer illness problems had any impact on the improved results and medal count in the 2010 Vancouver OWG compared with the 2006 Turin Games cannot be determined from the present study. Since no such data are published from other teams in similar settings, we can neither support nor refute our observation with results from similar studies.

We do not know to what extent the reduced prevalence of illness in the Vancouver team, compared with the Turin team, was due to the intervention with illness-prevention measures described above. Nevertheless, based on the strong compliance with the majority of the intervention strategies before and during the 2010 OWG and the reliability of the illness data collected during both of the 2006 and 2010 OWG,^{28 31} we suggest that the preventive measures contributed significantly to the lower illness rate in the Norwegian team in Vancouver. Compared with the Turin OWG, the strategy of illness prevention in the Vancouver OWG differed in that it included an increased number of preventive measures. Some of the measures used in Vancouver were already established as routines in the Turin Games. However, several new elements were added before and during the Vancouver Games.²⁷ For example,

Table 3 Illness in the Norwegian team during the 2010 Vancouver Olympic Winter Games

Sport	Type of illness	Treatment	Consequences
Nordic combined	Mononucleosis	Returned to Norway	Did not compete
Nordic combined	Pharyngitis	Isolation for 4 days	Missed one of four competitions
Cross-country skiing	Pharyngitis	Isolation for 3 days	Missed one of two competitions
Cross-country skiing	Pharyngitis	Isolation for 3 days	Missed a potential relay leg
Ice hockey	Gastroenteritis	Isolation for 2 days	Competed according to schedule

Table 4 Illness in the Norwegian team during the 2006 Turin Olympic Winter Games

	Type of illness	Treatment	Consequence
Nordic combined	Respiratory infection	Moved to low altitude	Missed one competition
Nordic combined	Respiratory infection	Isolation	Missed one competition
Nordic combined	Respiratory infection	Isolation	Missed one competition
Nordic combined	Gastroenteritis	Isolation	Missed one competition
Cross-country skiing	Gastroenteritis	Isolation	Missed one competition
Cross-country skiing	Gastroenteritis	Isolation	Reduced performance
Cross-country skiing	Gastroenteritis	Isolation	Reduced performance
Cross-country skiing	Respiratory infection	Isolation	Missed one competition
Cross-country skiing	Respiratory infection	Isolation	Missed one competition
Cross-country skiing	Respiratory infection	Isolation	Missed one competition
Biathlon	Respiratory infection	Antibiotics	Reduced performance
Biathlon	Pharyngitis	Antibiotics	Reduced performance
Speed skating	Allergic reaction	Antihistamines	Reduced performance

athletes in strong contention for Olympic medals who had experienced a tough competition programme prior to arrival in Vancouver received special treatment in the form of a single room and, if possible, private bathrooms. Special attention was also given to athletes with respiratory problems. A full asthma and allergy screening was performed at the beginning of the season, and the athletes were followed closely through precomp and all the way to the completion of the 2010 OWG.

Perhaps the most important difference between the Turin and Vancouver OWGs was the way in which illness-prevention strategies were introduced and systematically followed up.²⁷ According to the interviews performed before and after the Games, trust and good relationships between the health team and sport teams seem to be a core element in successful preparation and prevention programme for Vancouver 2010. In contrast, before Turin, in some teams personnel of the medical staff from the Olympiatoppen were seen as newcomers or 'intruders.' They failed to develop the necessary relationships with athletes and coaches. Preparations for Vancouver emphasised better relations between the medical team and the sport teams, and the medical staff from Olympiatoppen were to a greater extent included in teams before and during the 2010 OWG.²⁶

Another explanation for the reduced illness rate could be the general increased attention to preventive measures that came out of the swine flu in the 2009/2010 winter season. Epidemiological surveillance data in several countries have shown that the prevalence of several contagious illnesses was reduced during this period, most likely due to improved hygiene measures.²⁵ Under the Youth Commonwealth Games in India in 2008, following implementation of hygiene guidelines including only drinking bottled water, eating hot food and regular hand washing with alcohol gel, the incidence of travellers' diarrhoea in the whole squad reduced significantly compared with the reconnaissance trip (preguidelines).²⁵

Prevention of illness and infection was a central theme when athletes' residences were chosen. There were important lessons from Turin, where illness problems may have been linked to substandard cleaning of the kitchen and living- and dining rooms in locations outside the Olympic Villages. Such conditions particularly affected the cross-country ski team and the Nordic combine team. Lack of proper hygiene measures was regarded as a major reason why contagious virus was spread among athletes and other team members. However, in Vancouver, the members of the medical team inspected all athlete residences outside Olympic Village prior to the arrival of the athletes and took part in the quality control of the standard of hygiene in the selected accommodations.³¹

A more clear and stringent strategy regarding communication between athletes, medical staff and other team members was observed when symptoms of illness appeared in the team during the Vancouver OWG. This resulted in prompt action including isolation of any team members that came down with signs and symptoms of infections. It is conceivable that improved communication and loyalty to the medical staff decisions have reduced the spread of illnesses in Vancouver compared with the Turin Games where communication and decision-making with regard to illness were considered less clear.

Limitations and possible implications

This investigation was carried out with a primary focus on the possible effect of increased efforts to prevent illness on the prevalence of such illnesses during the Vancouver OWG and possibly on the overall results of the Norwegian team in the 2010 OWG. There are several methodological problems related to establishing a causal effect of the prevention programme on subsequent prevalence of illnesses in the team as well as controlling for confounding factors. Therefore, we cannot determine to what extent the reduced incidence of illness in the Vancouver team, compared with the Turin team, was due to the illness-prevention measures described above. Additionally, owing to the limited number of athletes involved, no firm

What is already known on this topic

- ▶ There are limited data on the incidence of illness in multi-sport events. The data have been categorised by sports, but hardly by national teams.
- ▶ The International Olympic Committee carried out a surveillance study on illness in the Vancouver 2010 Olympic Winter Games.

What this study adds

- ▶ A documentation of illness rate in a national Olympic team.
- ▶ An analysis of how the Norwegian Olympic team implemented a systematic approach to prevention and treatment of illness before and during the 2010 Vancouver Olympic Winter Games.

conclusions can be drawn regarding the effect of illness reduction on the medal count.

CONCLUSION

The incidence rate of illness in the Norwegian team in the Vancouver OWG was less than half that in the Turin OWG in 2006. It is possible that this reduction in illness incidence contributed to the improved performance and overall results of the 2010 team compared with the 2006 team.

Although no definite cause-and-effect link between the implementation of preventive measures and the prevalence of illness in the 2010 OWG could be established in this observational study, the low prevalence of illness compared with other nations in the Vancouver OWG and the reduced illness rate compared with the 2006 OWG suggest that the preparations were effective.

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Competing interest None.

Patient consent Obtained.

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