

Returning persons with SARS-CoV-2 to the field of play in professional golf: a risk assessment and risk reduction approach

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ABSTRACT

Objectives This pilot study aimed to see whether a risk assessment and risk reduction approach was a practical and feasible approach, as compared with standard isolation for fully vaccinated, asymptomatic persons positive for SARS-CoV-2.

Methods This prospective cohort study included all players and caddies participating in two large professional golf events from 7 to 20 February 2022 in South Africa. Fully vaccinated persons testing positive who were asymptomatic were subject to risk assessment and risk reduction measures to protect the integrity of the event. Asymptomatic individuals who could socially distance in outdoor areas were allowed to participate. Close contacts were subject to daily rapid antigen tests and asked to prioritise outdoor space.

Results The protocols put in place for the events were practical, feasible, and well accepted by event participants and staff during the study period. There was a total of 378 player-week episodes and 378 caddie-week episodes during the study period. Three persons tested positive while registered at events during the study period (0.4% of person episodes). The positive tests were returned from two players and one caddie, all of which were asymptomatic at the time of testing. There was one high-risk contact who consistently returned negative antigen tests. There was no evidence of transmission.

Conclusions The approach was practical and feasible. A risk assessment and risk reduction approach allowed fully vaccinated asymptomatic persons with SARS-CoV-2 to participate in golf, an outdoor sport where social distancing is possible, compared with standard isolation.

INTRODUCTION

SARS-CoV-2 was identified in December 2019 following an outbreak in Wuhan, China.¹ The WHO declared a Public Health Emergency of International Concern in January 2020, and as of April 2022, the virus continues to spread rapidly. The policy response has been to embark on the development and deployment of vaccines and tests, and place restrictions aiming to mitigate the effect of the virus and limit its spread while dynamically assessing

WHAT IS ALREADY KNOWN ON THIS TOPIC

- ⇒ Research from professional golf in 2020 has shown no player-to-player SARS-CoV-2 transmission.
- ⇒ Risk assessment and risk reduction measures in 2021 in professional golf allowed events to go ahead, where otherwise this may not have been possible.

WHAT THIS STUDY ADDS

- ⇒ A risk assessment and risk reduction approach allowed asymptomatic fully vaccinated persons with SARS-CoV-2 to participate in golf, an outdoor sport where social distancing is possible, compared with standard isolation.
- ⇒ Risk assessment and risk reduction measures can enable persons to work, and professional sports events to go ahead, where previously this may not have been possible.
- ⇒ This approach was practical and feasible, and the pilot was not associated with disease transmission, increased hospital admissions or negative health outcomes.

HOW THIS STUDY MIGHT AFFECT RESEARCH, PRACTICE AND/OR POLICY

- ⇒ This study may support further research and inform strategies to allow persons testing positive for SARS-CoV-2 to participate in outdoor activities, where social distancing is possible.
- ⇒ Any risk of transmission should be balanced with potential physical and mental health benefits, and the ability of persons to return to work.

risk. In the absence of effective vaccines and with limited testing, initial restrictions were extensive, labelled as 'lockdown', in many countries and territories. Many countries recognised that socially distanced outdoor activities were low risk and reintroduced these ahead of the release of other restrictions.²⁻⁴ Although societal levels of physical activity have decreased during the pandemic,⁵ golf participation has increased globally by nearly



10% during this period⁶ perhaps as persons and governments recognise it as an outdoor sport where social distancing is routinely possible. Recent reviews have shown golf to be a low-risk environment for viral transmission and this has been supported at a policy level.²⁷

Golf provides on average 4.5 metabolic equivalent of tasks, which equates to a moderate intensity level of activity.⁸ Early measures to participate in sport during the COVID-19 pandemic began with outdoor, socially distanced physical activity being permitted when tight restrictions/‘lockdown’ were in place, recognising the health benefits of physical activity and low risk associated with outdoor, socially distanced sport.⁹ International sport then returned behind closed doors, following WHO¹⁰ and Sport Specific Guidance¹¹ with risk assessment and risk reduction measures helping avoid any excess transmission.¹² Events then allowed spectatorship, with the 149th Open Championship and other golf events generally found not to be associated with excess transmission when participants were subject to COVID-19 status certification (proof of vaccination or recent negative test).¹³ In parallel to this, daily testing and risk mitigation for close contacts of those with COVID-19 were introduced in golf,¹⁴ sport and wider workplace settings.^{15 16} This was not associated with excess transmission compared with standard isolation.

International sporting and cultural events organisers contributed to and followed WHO guidance on mass gatherings following careful risk assessment and risk reduction strategies.^{7 10 11} Typically, these events returned in 2020 ‘behind closed doors’, with no live audience, and very high levels of risk mitigation, oversight and testing, and without contributing to increased transmission.^{12 17} Key non-pharmaceutical interventions have been implemented at international golf events since golf returned in 2020.¹⁸ These included social distancing, mask use in all shared indoor areas, enhanced hygiene, mandatory online education, daily symptom and contact history checks, and regular reverse transcriptase PCR (RT-PCR) testing. Rates of SARS-CoV-2 infection and transmission were extremely low during 2020, with closed-loop or ‘bubble’ environments.¹⁸ With vaccines being deployed at scale, restrictions to daily life and sporting events changed, live audiences returned and international travel was less limited in 2021 than it had been in 2020. Studies showed European Tour Group events maintained low rates of transmission, and in keeping with other sectors^{15 16} were able to safely allow close contacts to work (as opposed to standard isolation) with enhanced protocols in place.^{14 19}

The Omicron variant led to further uncertainty for professional sporting events. This variant was fast spreading²⁰ with a degree of vaccine escape.²¹ However, its clinical impact for each case was less severe than the Delta variant²² and overall, three doses of vaccine were shown to be effective against reducing illness severity and death.²³ In 2022, some countries altered policy whereby persons testing positive for SARS-CoV-2 are not required

to isolate, but are advised to follow specific guidelines to decrease viral transmission risk. South Africa announced that effective from 1 February 2022, persons who were asymptomatic and tested positive would not be required to isolate.²⁴

Recognising these changes, the Sunshine Tour, Challenge Tour, DP World Tour and Ladies European Tour worked with the host national government, health authorities and technical experts to permit asymptomatic persons testing positive for SARS-CoV-2 to participate and work at their professional golf events. While this benefits persons in being able to do their job, protocols and safe management practices were applied, to mitigate risk to others at the event. The purpose of this prospective study was to apply these protocols across two events, piloting whether the protocols were feasible and practical, and assessing transmission, outcomes of contacts, hospitalisation and serious health outcomes from available data among participants at the events.

METHODS

Protocols to permit asymptomatic, vaccinated persons positive for SARS-CoV-2 were developed by health and safety, and medical professionals working for the Sunshine Tour and European Tour Group, in collaboration with the Ministerial Advisory Committee and National Institute for Communicable Diseases (NICD) in South Africa. This prospective cohort study implemented these protocols and included all players and caddies participating in two professional golf events from 7 February to 20 February in South Africa. Persons not holding accreditation for the Sunshine Tour or Challenge Tour were not included.

For these events, baseline mitigation policies against COVID-19 were in place including:

1. Optimising the use of outdoor space.
2. Advice regarding social distancing.
3. Mask use in shared indoor space and where social distancing is not possible.
4. Maximal ventilation of indoor areas.
5. Daily checking of symptoms and contact history.
6. Encouragement of vaccine uptake to players and caddies, and mandate of vaccine to all others on-site.

Each event duration (practice and competition) was 6–8 days. A ‘person episode’ was defined as attendance at the golf facility for the duration of the tournament.

Screening, testing and processing

Rapid antigen testing was performed on entry into the event and an RT-PCR was performed if players later developed symptoms. Each day, a symptom and contact history checklists were completed online through an application (HealthDocs, South Africa) prior to admission to the event. Abnormalities were followed up by the COVID-19 operations team.

Feasibility and practicality

Players, caddies and event staff were briefed on the protocols. Daily meetings were conducted to maintain

protocols. Event COVID-19 team and medical officers were interviewed to determine practicality and feasibility.

Positive cases

When a person returning a positive SARS-CoV-2 test was identified, a full symptom and contact history was taken. Persons considered high risk or direct contacts (as per the WHO guidelines)²⁵ were required to do daily lateral flow testing and to maximise their use of outdoor areas. Where someone was positive and asymptomatic but had completed a course of vaccination with a WHO-approved vaccine course, they were permitted to participate using the 'asymptomatic positive case protocol' (online supplemental appendix 1). COVID-19 symptoms were defined as per NICD and Ministerial Advisory Committee in South Africa which included a new continuous cough, a fever and new shortness of breath. Screening was performed using a nasal swab taken by supervised self-swabbing. For any positive rapid antigen test in an asymptomatic individual, confirmatory PCR testing was performed. Contact tracing was conducted in line with WHO guidelines,²⁵ with risk mitigation policies put in place. Although South African legislation did not require additional measures for close contacts, the legislation does specify that event organisers should take appropriate measures to reduce risk. For these events, local guidance required all participants to take a minimum of one negative rapid antigen test on arrival. For symptomatic players with a positive result, the lead technician/event doctor informed the person and host public health authority and ensured immediate isolation was undertaken. For symptomatic players with a negative result, they were allowed to compete with encouragement of hand hygiene, social distancing and using outdoor spaces. For unvaccinated players, they were asked to isolate if they returned a positive test, regardless of symptom status.

Patients and/or the public were not involved in the design, or conduct, or reporting, or dissemination plans of this research.

Population COVID-19 rates

All national rates of COVID-19 were reported as new cases per day per 100 000 and extracted from the Our World in Data/University of Oxford site.²⁶

RESULTS

During the study period, there were two professional golf events conducted in South Africa. There was a total of 378 player episodes and 378 caddie episodes during the study period.

Feasibility and practicality

Players, caddies and event staff were briefed on the protocols. Players and caddies were supportive of the protocols, with no players or caddies voicing any opposition to their implementation. COVID-19 team and medical officers did not report any increased burden of work beyond the initial briefings.

SARS-CoV-2 transmission

Three accredited persons tested positive while at events during the study period (0.4% of person episodes). The positive tests were returned from two players and one caddie, all of whom were asymptomatic at the time of testing. Positive antigen tests were confirmed with RT-PCR on-site. During these events, there were 15 players who declared non-defining symptoms, for example, headache or sore throat. All tested negative on rapid antigen testing. There was no transmission of COVID-19 during the first event, with all subjects testing negative on entry testing for subsequent events, and no playing partners developing symptoms. Three positive participants were provided with medical surveillance but did not require any treatment nor required hospital admission.

Contacts

One person was classified as a high-risk contact, while monitoring was conducted on the caddies and playing group of the positive participants (despite these persons being socially distanced). The individual defined as a high-risk contact had shared accommodation with a positive player immediately prior to the first event of the study. They were fully vaccinated, asymptomatic and tested negative on antigen testing daily for 7 consecutive days post-exposure. A summary of findings can be seen in [figure 1](#).

Local COVID-19 rates

The number of players per event and local rates of COVID-19 at the time of the tournament can be seen in [table 1](#). Local COVID-19 rates were reported on the date of the first day of the event. If this was not available, a weekly average was used. The number of daily cases per 100 000 of the population during the first and second event was 2 per 100 000 ([table 1](#)), although case ascertainment is thought to be <20% in this phase of the pandemic in South Africa.

DISCUSSION AND COMPARISON WITH THE LITERATURE

In this study, we have piloted the feasibility and practicality of returning persons positive for SARS-CoV-2 to an outdoor and socially distanced field of play in a low-humidity environment. Preliminary safety and transmission data were also collected. This follows a gradual decrease in restrictions from an initial lockdown, by reviewing available literature, studying knowledge gaps and implementing evidence-based strategies based on this science while also considering how to support the viability of sports events.

Risk assessment and risk reduction measures can allow persons to work and professional sports to function optimally, where standard isolation may be substantially disruptive and where human and technical resource is sufficient to support these processes. When the current study protocol was described to athletes, there was very strong support. They frequently highlighted the outdoor nature of the sport, and their nervousness regarding

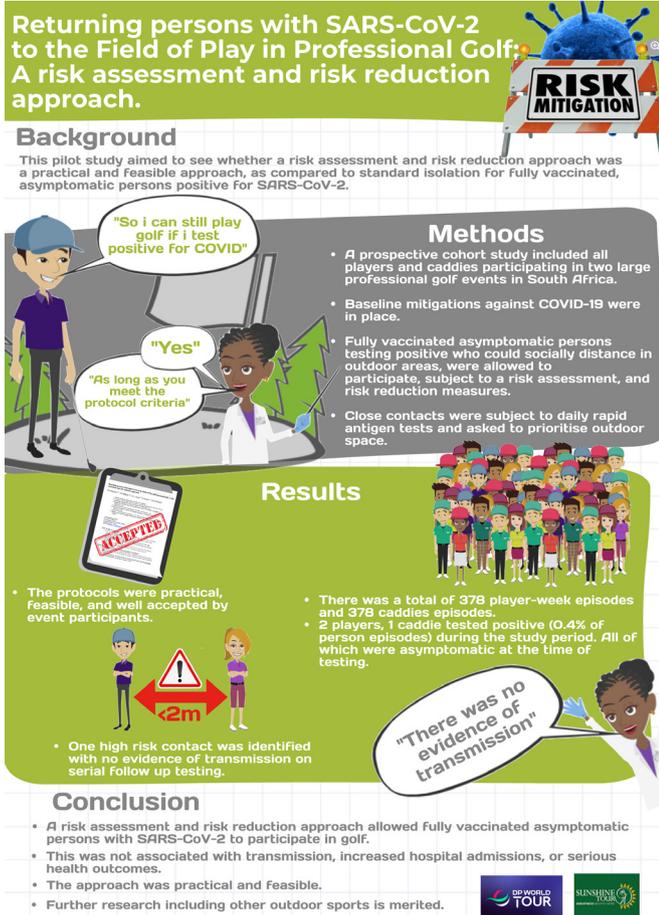


Figure 1 Visual summary of the results of returning persons with SARS-CoV-2 to the field of play in professional golf.

antigen/RT-PCR screening which had caused many persons to miss events due to asymptomatic positive tests. This has been a cause for clinical anxiety in some.

To our knowledge, this is the first study to assess the return of athletes who are positive for SARS-CoV-2 to the field of play. There has been much discussion about long-term strategy regarding COVID-19 and the balance between minimising risk of transmission and the harms that restricting individuals and society has.²⁷ For a sportsperson, periods of isolation, when feeling entirely well, is reported to negatively impact the well-being and ability to work for athletes.²⁸

Professional sport has collaborated with the WHO, national governments and across different sports to recognise the requirement to continuously review and update health protocols and strategies. SARS-CoV-2 rates, vaccination rates and the policy response of governments

have varied, and sports participants have abided by differences in regulations/guidelines in the host country of competition. Sport has worked with governments to study a proposed change and implement them in practice.^{9 13}

Using the risk assessment and risk reduction approach in this study, three persons positive for SARS-CoV-2 were able to participate. The ability for persons to participate in these events was beneficial for them and for the events themselves. Isolation in foreign countries, distant from families and friends, may have potential negative effects on participants mental and physical health. There is no evidence of health risk to the positive individual during light-to-moderate physical activity when asymptomatic for the disease.^{29 30}

It is possible that the findings of this study will encourage other sports and countries to allow asymptomatic persons with SARS-CoV-2 to participate in activities that are outside and socially distanced. The available evidence suggests outdoor sporting environments carry very little risk of transmission.^{12 17 19} Unforeseen benefits of this strategy may also encourage workers and the general public to be more willing to declare positive tests and engage in screening if they appreciate they will not have to fully isolate if asymptomatic, but rather modify behaviours.³¹ However, the physiological demands of exercising while SARS-CoV-2 positive must be considered in the light of disease severity as well as the environmental conditions such as heat and humidity.

Limitations

This study has a number of limitations. It has been shown to be practical and feasible in a setting where COVID-19 officers are immediately available, and able to put in place risk assessment and risk reduction measures, in a country where it is legal not to self-isolate if asymptomatic. The dominant variant during this period of study was Omicron, which has many differences to previous variants.²¹ Rates of full vaccination according to WHO criteria among attendees were >90%. In environments where this is not the case, rates of hospitalisation or negative health outcomes may increase. Furthermore, we acknowledge that case ascertainment was lower in South Africa during the time of this study compared with some European countries, as the NICD deprioritised asymptomatic screening, which has subsequently been mirrored in many European countries.

This study also assessed only two sporting events, with 756 subject episodes-weeks and a larger, long-term follow-up study would be required to better explore

Table 1 Schedule of included events and local COVID-19 rates

Event	Location	Players (n=)	Date of event	National daily COVID-19 incidence per 100 000 of population
Dimension Data Pro Am	George, South Africa	162	7–13 Feb 2022	2
Bain's Whisky Cape Town Open	Cape Town, South Africa	216	14–20 Feb 2022	2

effects on transmission, hospitalisation and death as well as achieving longer follow-up of participants to understand the true health implications of the protocol such as long COVID. Golf is a sport where the athletes are generally rules orientated and compliant, and where social distancing is possible, so conclusions should be drawn with caution for other sports and settings, and would not apply to indoor settings where risk of airborne spread has been demonstrated to be much higher than outdoor environments.³² In addition, careful consideration should be made on a case-by-case basis particularly if the sporting activity requires vigorous intensity physical activity.

CONCLUSION

A risk assessment and risk reduction approach was practical and feasible in this setting, and allowed fully vaccinated, asymptomatic persons with SARS-CoV-2 to participate in golf compared with standard isolation. Risk assessment and control measures can enable persons to work and professional sports events to go ahead, where previously this may not have been possible. This did not appear to be associated with increased transmission, hospital admissions or other negative health outcomes.

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Contributors PGR wrote the manuscript, edited and reviewed the final manuscript. AM conceived the study idea, wrote the manuscript, edited, reviewed the final manuscript and is guarantor of the study. DG edited and reviewed the final manuscript. GC edited and reviewed the final manuscript. WJDP was responsible for data collection, edited and reviewed the final manuscript.

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Competing interests AM, DG and GC have paid roles with the DP World Tour, Ladies European Tour and Challenge Tour. WJDP has a paid role on the Sunshine Tour.

Patient and public involvement Patients and/or the public were not involved in the design, or conduct, or reporting, or dissemination plans of this research.

Patient consent for publication Obtained.

Ethics approval This study involves human participants and ethical approval was granted by the local ethics committee of Liverpool John Moores University (21/SPS/008). Participants gave informed consent to participate in the study before taking part.

Provenance and peer review Not commissioned; externally peer reviewed.

Data availability statement Data are available upon reasonable request.

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Protocol Development for fully vaccinated asymptomatic SARS-CoV-2 positive participants in Professional Golf tournaments.

1. Background

An amendment of the Regulations, government notice R1715, to the Disaster Management Act was published in the Government Gazette no. 45855 on February 01, 2022

Regulation 7 (1) was amended as follows:

“Any person who is a confirmed laboratory positive COVID-19 case and is asymptomatic is not required to isolate”

Professional Golf Tournaments resumed from August 2020 and have been safely played during the peaks of the four COVID-19 waves in South Africa and countries throughout the world.

Research conducted throughout two seasons on the DP World Tour Golf, showed no evidence of transmission on the Field of Play, but rather from shared accommodation, shared transport, and shared indoor space.

The observations by scientists during and after the Omicron wave were that, despite the contagiousness of the variant, fully vaccinated persons who became infected, were in the main asymptomatic or experienced minor symptoms.

Professional athletes are currently withdrawn from participation when a positive test result is returned and are not allowed to participate in a tournament.

The withdrawal of an asymptomatic, healthy athlete due to a positive COVID-19 test has resulted in mental health concerns to the point where the athletes experience anxiety symptoms when tested because feeling healthy does not guarantee participation. The determination for participation is the outcome of a SARS-CoV-2 Antigen/PCR test.

The nature of the sport of golf lends itself to implement a protocol for positive participants being an outdoor sport where physical distancing from other persons is possible.

The Sunshine Tour/ Challenge Tour/ DP World Tour have developed the protocol below which will allow for the participation of fully vaccinated athletes and caddies who are asymptomatic but tested positive at its Tournaments

2. Protocol Development

2.1 Risk assessment and Risk mitigating processes.

2.1.1 Health risk and Vaccination status.

Only fully vaccinated participants can be enrolled in the Asymptomatic SARS-CoV-2 Positive Participant Protocol.

2.2.2 Protection of Personal Health Information (PHI)

The positive participant must give informed consent for his/her SARS-CoV-2 status to be revealed to, his/her caddie, other participants in the group in which he/she plays, and the Rules Officials assigned to the Tournament

2.2.3 Areas/situations where physical distancing criteria are stipulated

(i) Warm-up areas

Driving range and practice greens.

The positive participant **MUST** maintain physical distancing of > 3 metres from any other individual when on the practice range

The positive participant may only use the practice green when physical distancing of > 3 metres is possible.

(ii) On the course

Golf courses span over approximately 36 hectares and there are only two areas on the course where the golfers congregate which are addressed below.

➤ Teeing area

The positive participant must ensure that physical distancing of > 5 m is maintained at all times between him/her and the fellow participants. In order to achieve this the positive status of the participant must be divulged to the fellow participants to assist the positive participant in maintaining this distance

➤ Greens/ Putting areas

The positive participant must ensure that physical distancing of > 5 m is maintained at all times between him/her and the fellow participants. In order to achieve this the positive status of the participant must be divulged to the fellow participants to assist the positive participant in maintaining this distance

(iii) **Interaction during a round where physical distancing will be less than 5 metres**

➤ Rules Officials

The positive participant's SARS-CoV-2 status must be shared with the Rules Officials assigned to the tournament. Should the positive participant need a ruling the participant and the Rules Official must adhere strictly to the NPI requirements with the additional precaution that physical distancing of not less than 3 metres are maintained during this process.

➤ Caddie of Positive Player.

The caddie must be informed of the SARS-CoV-2 status of the player. The player's caddie **MUST** be fully vaccinated to continue with his/her duties.

The caddie has the option to elect not to continue with his/her duties. Should the caddie not be vaccinated or do not wish to continue, the player can use a different caddie

The caddie and the player must maintain a physical distancing of >5 metres except during the period of shot preparation on the course.

During this period the caddie must wear his/her mask. The duration of the interaction during shot preparation where physical distancing of < 5 metres will occur may not be exceed 2 minutes.

➤ Player of Positive Caddie

The player must be informed of the COVID-19 status of the caddie.

A fully vaccinated player has the option to elect not to continue using the caddie. An unvaccinated player must select a new caddie

The caddie and the player must maintain a physical distancing of >5 metres except during the period of shot preparation on the course.

During this period the caddie must wear his/her mask. The duration of the interaction during shot preparation where physical distancing of < 5 metres will occur may not be exceed 2 minutes.

➤ Score recording

Score recording is normally set-up indoors and a positive participant may not enter any closed environments

Alternative methods to submit scores such as an electronic copy of the signed scorecard to be submitted and telephonically verification the score should be considered. The Tournament Director to communicate to the CMO/CCO the procedure to be followed at the event.

Protocol for fully vaccinated asymptomatic SARS-CoV-2 positive participants in Professional Golf tournaments.

Should a participant in a professional golf tournament return a positive Antigen/PCR test result and is assessed to be asymptomatic and physically unaffected by the infection, the participant will be given the option to follow the Protocol for fully vaccinated asymptomatic SARS-CoV-2 positive participants and continue with participation in the event.

The Medical Officer/Compliance Officer is responsible to ensure strict adherence to the protocol and responsible to obtain the informed consent as required for the sharing of PHI

1. Process

- Positive test result

Should a Participant in a professional golf event tests positive using an Antigen/PCR test the symptomatology needs to be assessed and should the participant be asymptomatic he/she will be allowed to participate in the event.

- The Chief Medical Officer (CMO)/Covid Compliance Officer (CCO) must inform the participant of the requirements for further participation and obtain the informed consent from the participant that his/her SARS-CoV-2 positive status may be shared with selected persons in the event

2. Protocol requirements:

- Participant must be vaccinated
- Participant must give informed consent that his/her SARS-CoV-2 status may be shared with pre-determined individuals
- May not share a room
- Must self-drive
- May only commute between their accommodation and the tournament venue
- May not enter any closed environments while at the course.
- Must ensure that > 3 metre physical distancing is maintained on the practice range and the practice green
- Must adhere to the physical distancing requirements of > 5 m while on the course, except
 - during a Ruling where the Rules Official must adhere strictly to the NPI requirements with the additional precaution that physical distancing of not less than 3 metres is maintained during this process.
 - during the shot preparation with his/her caddie. During this period the caddie is required to wear his/her mask. The duration of the interaction during shot preparation where physical distancing of < 5 metres will occur may not be exceed 2 minutes.

3. Sharing of positive status of participant during the event.

The CMO/CCO must inform the TD the positive case and clarify

- the process of communication with relevant role players who need to be informed.
- the process to be followed for scoring and score recording

3.1 At the start.

Verbatim to participants in the positive participant's group by CMO/CCO or alternative

- If the positive participant is a player:

XXXX tested positive for SARS-CoV-2/ COVID-19 and must adhere to the following protocol to ensure a safe environment for all

- Maintain Physical distancing of > 5 metres from other members in the group
- He/she is not required to wear a mask
- He/she is not allowed to exchange scorecards
- We request that you assist the player to maintain his/her physical distancing especially on the teeing area and on the greens

- If the positive participant is a Caddie:

XXX caddie of player YYY tested positive for SARS-CoV-2/ COVID-19 and must adhere to the following protocol

- Physical distancing of >5 metres from other members in the group
- When necessary to touch the flag stick or rake will sanitise prior and post touching
- Will wear a mask when < 5 m from any person on the course

3.2 Communication to Officials, Scorers, Starter on the course

XXXX on the course in match no YYY tested positive for SARS-CoV-2/ COVID-19.

In terms of the ST protocol for fully vaccinated asymptomatic SARS-CoV-2 positive participants he/she is allowed to play/caddie

The following NPI protocol to be followed by officials when interacting with the player

- Official must wear a mask at all times when interacting with the player
- Maintain physical distancing of > 3 metres when interacting with the player
- Minimise interaction time with the player.

Note: should duration of Interacting with the player exceeds 15 minutes the CMO/CCO must be informed.

This protocol will remain in place until a negative Antigen/PCR test result is returned. The CMO/CCO is responsible to inform the TD of the change in the status of the participant.