

Original Article  
Preventive & Social Medicine



# A Novel Screening, Brief Intervention, and Referral to Treatment (SBIRT) Based Model for Mental Health in Occupational Health Implemented on Smartphone and Web-Based Platforms: Development Study With Results From an Epidemiologic Survey

OPEN ACCESS

**Received:** Oct 7, 2022  
**Accepted:** Feb 2, 2023  
**Published online:** Apr 20, 2023

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## ABSTRACT

**Background:** While the importance of mental health is well-recognized in the field of occupational health, implementation of effective strategies in the workplace has been limited by gaps in infrastructure, program comprehensiveness, coverage, and adherence. The authors developed a Screening, Brief Intervention, and Referral to Treatment (SBIRT) model based occupational mental health intervention, and implemented in a web-based format with a smartphone application.

**Methods:** The SBIRT-based intervention was developed by a multidisciplinary team, including occupational health physicians, nurses, psychiatrists, and software developers. The following mental health areas were included, based on outcomes of an epidemiological survey conducted: insomnia, depression, anxiety, problematic alcohol use, and suicidal risk. The viability of the two-step evaluation process utilizing a combination of the brief version and the full-length version of the questionnaire was examined using responses from the survey. The intervention was adjusted according to the survey results and expert opinions.

**Results:** The epidemiological survey included 346 employees who completed the long-form version of mental health scales. These data were used to confirm the diagnostic value of using a combination of short-form and long-form version of the scales for screening in the SBIRT model. The model uses a smartphone application for screening, provision

**Funding**

This work was supported Smart Healthcare Research and Development Program through Korea Health Promotion Institute funded by the Korea Health Industry Development Institute (KHIDI), South Korea (Grant number: HS20C0110). The funding source had no involvement in the study design; the collection, analysis, and interpretation of data; in the writing of the paper; and in the decision to submit the article for publication.

**Disclosure**

The authors have no potential conflicts of interest to disclose.

**Author Contributions**

Conceptualization: Kim J, Kim H, Jung D, Kim HJ, Jo H, Koh SB, Hahm BJ. Data curation: Kim J, Jo H, Koh SB. Formal analysis: Kim J. Funding acquisition: Jung D, Kim HJ, Koh SB, Hahm BJ. Investigation: Kim J, Kim H, Jung D, Kim HJ, Jo H, Koh SB, Hahm BJ. Methodology: Kim J, Yeom CW, Kim H, Jung D, Kim HJ, Jo H, Koh SB, Hahm BJ. Project administration: Koh SB. Software: Kim H. Supervision: Yeom CW, Hahm BJ. Validation: Jo H, Hahm BJ. Visualization: Yeom CW, Kim H. Writing - original draft: Kim J. Writing - review & editing: Yeom CW, Jung D, Kim HJ, Jo H, Koh SB, Hahm BJ.

of psychoeducation, and for surveillance. The universal methods of the model ensure it can be implemented by all occupational managers, regardless of their specialization in mental health. In addition to the two-step screening procedure to identify employees at-risk for mental health problems, the model includes a stepped care approach, based on risk stratification, to promote mental health education, management, and follow-up for continuous care.

**Conclusion:** The SBIRT model-based intervention provides an easy-to-implement approach for the management of mental health in the workplace. Further studies are required to examine the effectiveness and feasibility of the model.

**Keywords:** Occupational Health; Mental Health; Screening; Surveillance; Digital Technology; SBIRT

**INTRODUCTION**

While traditionally occupational health has focused on exposure to hazardous materials (chemical, biological, or physical), mental health is gaining increasing interest in the field.<sup>1</sup> Numerous studies have identified working conditions, such as job stress,<sup>2</sup> shift work,<sup>3</sup> and exposure to physical or chemical hazards,<sup>4,5</sup> as risk factors for mental health problems. Moreover, there is a bidirectional relationship in that mental health also affects occupational experience. In the United Kingdom, approximately 40% of sick leaves in the workplace are attributed to mild mental disorders, such as depression and anxiety.<sup>6</sup> Moreover, mental disorders cause a major disease burden among individuals of working age,<sup>7</sup> underlining the need to promote mental health in occupational settings.

Although increased attention on mental health promotion in workplaces has encouraged governments to implement legislation, gaps exist between laws and their enforcement, even in industrialized countries. Jain and colleagues<sup>8</sup> have divided the gap into three categories: infrastructure and human resources (implementation gap), qualitative comprehensiveness (capacity gap), and inclusion of all employees (coverage gap). In South Korea, occupational health management is similarly challenged in that tasks of mandatory occupational health managers within companies are often limited to managing work-related injuries and chronic diseases, such as hypertension and diabetes.<sup>9</sup> Challenges and barrier to implementing mental health strategies are multifactorial in nature, including a lack of professionals and of comprehensive systems for screening and treatment of at-risk populations, as well as a lack of concern among employers.<sup>9</sup> Therefore, there is a need for an easy-to-implement intervention for occupational mental health to provide a universal management approach, regardless of the specialization of occupational health managers in workplaces.

Digital technology has been employed in occupational mental health management<sup>10</sup> to provide greater accessibility and reduced professional requirements, and thus can enhance coverage and improve implementation gaps.<sup>11,12</sup> However, digital interventions do have limitations. As an example, a study using a web-based approach found that while the intervention was effective in accelerating the rate of return to work, low adherence of both occupational physicians and participants and a high rate of loss to follow-up were identified.<sup>13</sup> Low adherence was also identified in another study conducted among nurses, in which more than half of the participants assigned to an e-mental health intervention dropped out.<sup>14</sup> In addition to

adherence problems, insufficient maintenance of benefits for employees underlined the need for a continuous approach to the management of occupational mental health.<sup>12</sup>

A novel approach can be adopted from Screening, Brief Intervention, and Referral to Treatment (SBIRT) model. Intended to be implemented by non-professionals (such as in primary care or by nursing staff),<sup>15</sup> the model could improve universal access to effective mental health management in the workplace. The SBIRT model was initially developed to identify and provide treatment for substance use disorders.<sup>15</sup> Between the steps of screening and referral, the practitioner delivers brief interventions that focus on enhancing an individual's insight and awareness on their disorder.<sup>15</sup> Evidence of the effectiveness and feasibility of the SBIRT model in the workplace is accumulating.<sup>16,17</sup> It has been found to be effective for other mental health problems in community samples.<sup>18</sup> Considering that the importance of worker health surveillance programs has long been emphasized in occupational medicine,<sup>19</sup> the SBIRT model has the potential to provide cost-effective benefits to employees.

Based on this evidence and the identified need for effective management of occupational mental health surveillance, we developed a SBIRT model-based intervention that uses a smartphone application to guide occupational health managers and employees in promoting mental health surveillance, education, and treatment in the workplace. The SBIRT-based approach was designed to fulfill the following three criteria: easy implementation, good adherence, and continuous management.

## METHODS

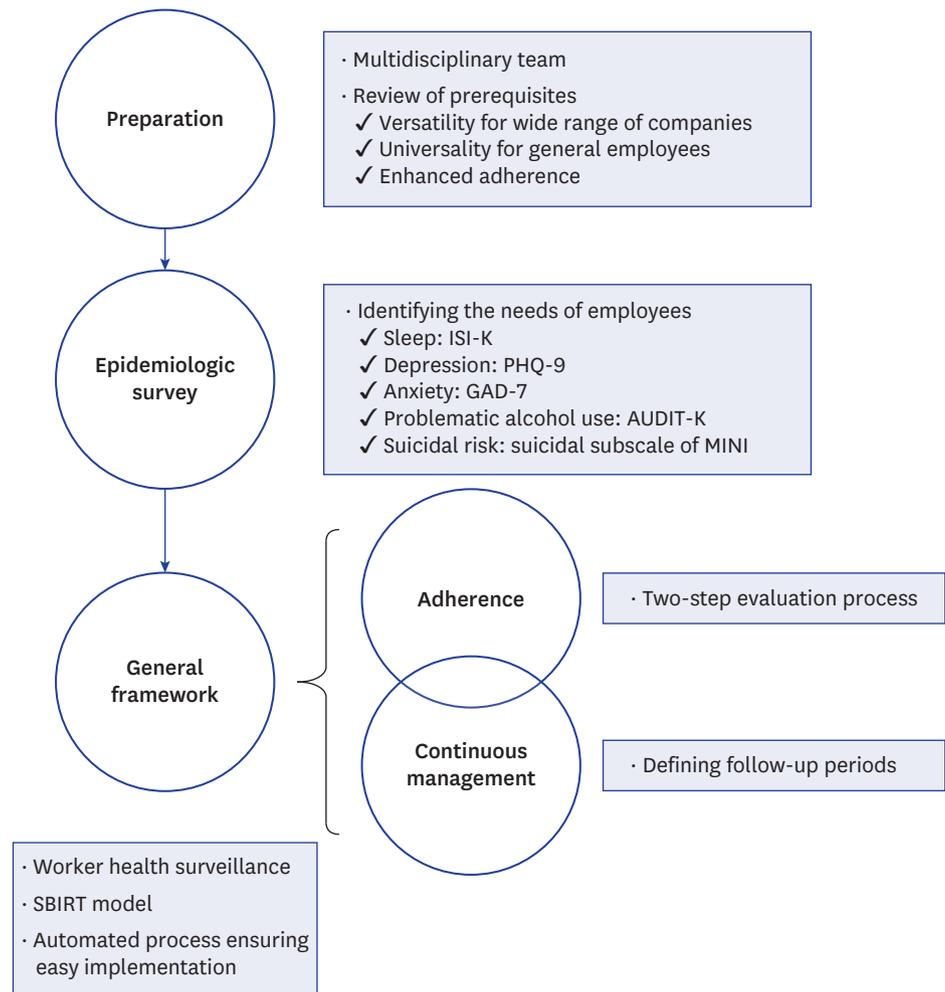
The new SBIRT model based occupational mental health management system we present herein was included as part of a larger occupational health promotion system. The system is designed to help occupational health managers provide better management of their employees' mental health issues. The system integrates participants' basic demographic data, medical information, and lifestyle factors, with an evaluation of job stress.

### Preparation phase

The flow diagram of the development process for our model is illustrated in **Fig. 1**. The model was developed by a multidisciplinary team, including occupational health physicians, nurses, psychiatrists, and software developers. Opinions from occupational health managers were also gathered on several occasions with the goal of providing a better user experience with our digital intervention. Prerequisites for the implementation, such as occupational health management settings and implications from previous studies, were reviewed (**Fig. 1**).

### Epidemiological survey

We conducted an epidemiological survey to examine the need for mental health management among employees by evaluating the prevalence of mental health problems. Participants were recruited through advertisements and announcements to companies in Gangwon Province, South Korea, who were included in the occupational management service provided by Wonju Severance Christian Hospital. The study included all participants who consented, except for those who had difficulties using a smartphone, as the survey was conducted using a smartphone application. Through a smartphone application, participants completed the Korean version of the Insomnia Severity Index (ISI-K),<sup>20</sup> Patient Health Questionnaire (PHQ)-9,<sup>21</sup> Generalized Anxiety Disorder (GAD)-7,<sup>22</sup> Korean version of the Alcohol Use



**Fig. 1.** General flow of the development of the SBIRT-based occupational health intervention. ISI-K = Korean version of the Insomnia Severity Index, PHQ = Patient Health Questionnaire, GAD = Generalized Anxiety Disorder, AUDIT-K = Korean version of the Alcohol Use Disorders Identification Test, MINI = Mini International Neuropsychiatric Interview, SBIRT = Screening, Brief Intervention, and Referral to Treatment.

Disorder Identification Test (AUDIT-K),<sup>23</sup> and suicidality subscale of the Mini International Neuropsychiatric Interview (MINI).<sup>24</sup> The reported cut-off values for each scale were used to determine the prevalence of each mental health disorder, as follows: insomnia, 10; depression, 10; anxiety, 10; alcohol use disorder, 20 for men and 10 for women; and suicidal risk, 6. The proportion of participants for previously determined severity criteria was also reviewed.

### Development of the general framework

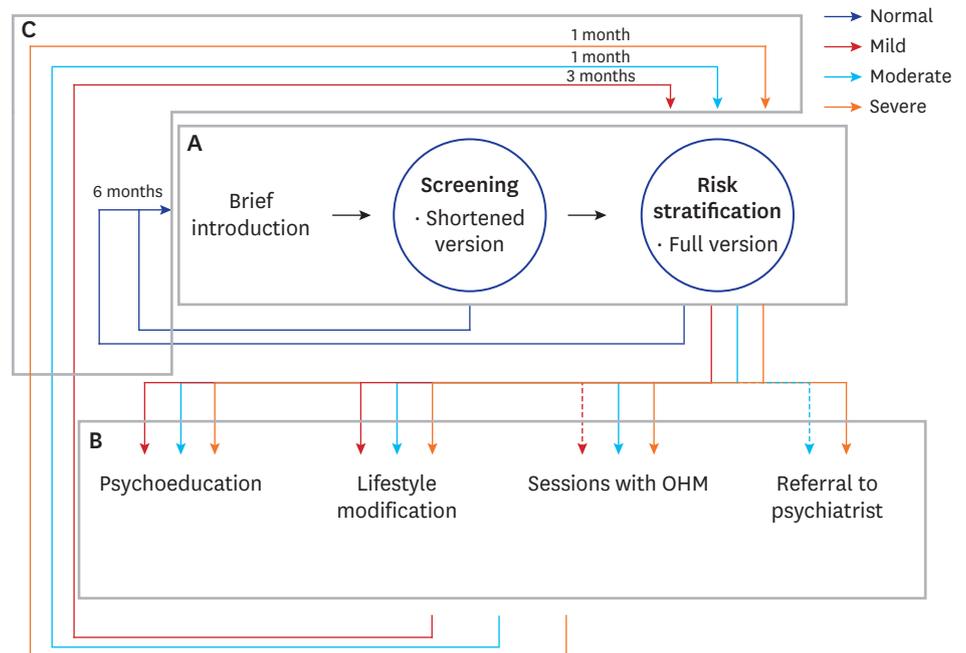
Following the epidemiological survey, the general SBIRT framework was developed. The SBIRT model includes regular screening, using self-administered questionnaires; brief interventions, based on psychoeducation delivered through mobile applications and sessions with occupational health managers; and referral to psychiatric treatment for employees with clinically relevant symptoms. The model was developed on a web-platform and included a smartphone application to guarantee accessibility to occupational health managers and employees. The model ensures that screening and access to psychoeducational materials is universally accessible, via smartphone applications, to employees, as needed, under supervision of occupational health managers in the workplace.

**Measures to enhance program adherence**

To enhance adherence, a two-step evaluation process was designed to simplify regular screening of mental health problems (Fig. 2A). This included the use of the short-form version of tools used to screen participants to reduce the burden of surveys. Those meeting the cut-off scores for a mental health problem are then asked to complete the appropriate long-form version of mental health scales used. The following short-form scales, in Korean, were selected for the first-step screening: ISI-3,<sup>25</sup> PHQ-2,<sup>26</sup> GAD-2,<sup>27</sup> and brief AUDIT<sup>28</sup> for insomnia, depression, anxiety, and problematic alcohol use, respectively. In the absence of a brief version of the suicidality subscale of the MINI, the suicide item (item 9) of the PHQ-9 was used.

To confirm that the two-step process did not alter the clinical validity of results, the two-step process was simulated using the results of the epidemiological survey. Kappa statistics and McNemar’s test were used to compare the differences between the one- and two-step processes. The ordinary kappa coefficient was calculated to examine the agreement between the two processes and McNemar’s test was used to identify differences in dichotomous diagnostic variables between the two processes. The quadratic weighted kappa coefficient was calculated for severity variables. Landis and Koch criteria used to interpret kappa coefficients.<sup>29</sup> The cut-off values for the first step were adjusted according to the results of statistical analyses combined with experts’ opinions.

All statistical analyses were two-sided with a significance threshold of 0.05. Statistical Package for the Social Sciences (SPSS) version 23 (SPSS, Chicago, IL, USA) was used to perform the analyses.



**Fig. 2.** The outline of the intervention. Each square represents parts of the intervention. (A) Screening and risk stratification; (B) Recommendations; (C) Follow-up and continuous surveillance. Colors of lines indicate the severity of symptoms for a mental health problem. Dashed line indicate that the strategy is offered on condition. OHM = occupational health manager.

### Measures for continuous management

Regular surveillance was planned for the continuous management of employees' mental health. In particular, the schedule for follow-up surveillance differed according to the risk stratification by severity for each mental health problem evaluated. This schedule of follow-up was determined based on expert opinions during multidisciplinary team meetings. Follow-up surveillance was automated, with reminders sent directly to employees and to occupational health managers, who could provide additional notification and follow-up for employees who do not complete their regular surveillance.

### Ethics statement

Our study was approved by the Institutional Review Board of Wonju Severance Christian Hospital (CR320167). Written informed consent was obtained from the subjects for their anonymized information to be published in this article.

## RESULTS

### Results from the epidemiological survey

A total of 346 employees completed the epidemiological survey, with the prevalence of each mental health problem presented in **Table 1**, and with the severity criteria for each scale presented in **Supplementary Tables 1-3**. The distribution of prevalence for each mental health problem screened for was as follows: insomnia, 10.7%; depression, 4.3%; anxiety, 3.5%; problematic alcohol use, 13.3%; and suicidal risk, 2.9%.

The ordinary kappa coefficient values for the one- and two-step evaluation processes were 1.00, 0.93, 0.96, 0.93, and 0.66 for insomnia, depression, anxiety, problematic alcohol use, and suicidal risk, respectively (**Table 1**). The kappa coefficients for diagnosis were within the 'almost perfect' range for insomnia, depression, anxiety, and problematic alcohol use, with 'substantial' agreement for suicidal risk. McNemar's test revealed that there was a statistically significant difference in prevalence between the one-step and two-step processes for insomnia ( $P = 0.008$ ). This result indicates that the widely accepted cut-off value of '7' for the ISI-3 is too high for the two-step process, resulting in some participants with sufficient

**Table 1.** Mental health problems among employees by diagnosis (N = 346)

| Mental health problems         | Prevalence | Kappa coefficient | P value for McNemar's test | Weighted kappa coefficient <sup>a</sup> |
|--------------------------------|------------|-------------------|----------------------------|---|
| <b>Insomnia</b>                |            |                   |                            |   |
| One-step                       | 37 (10.7)  | 1.00              | 1.000                      | 0.96                                    |
| Two-step                       | 37 (10.7)  |                   |                            |   |
| <b>Depression</b>              |            |                   |                            |   |
| One-step                       | 15 (4.3)   | 0.93              | 0.500                      | 0.68                                    |
| Two-step                       | 13 (3.8)   |                   |                            |   |
| <b>Anxiety</b>                 |            |                   |                            |   |
| One-step                       | 12 (3.5)   | 0.96              | 1.000                      | 0.59                                    |
| Two-step                       | 11 (3.2)   |                   |                            |   |
| <b>Problematic alcohol use</b> |            |                   |                            |   |
| One-step                       | 46 (13.3)  | 0.93              | 0.063                      | 0.78                                    |
| Two-step                       | 41 (11.8)  |                   |                            |   |
| <b>Suicidal risk</b>           |            |                   |                            |   |
| One-step                       | 10 (2.9)   | 0.66              | 0.063                      | 0.53                                    |
| Two-step                       | 5 (1.5)    |                   |                            |   |

Values are presented as number (%).

<sup>a</sup>Weighted kappa coefficients are calculated using severity variables.

symptoms of insomnia on the ISI-K being classified as normal on the ISI-3. Therefore, the cut-off value for ISI-3 was adjusted to '4,' as suggested in a recent study for use of the ISI-3 in a two-step screening procedure.<sup>30</sup> After adjustment, the results for the two evaluation processes showed a perfect match (Table 1).

### The new SBIRT-based model

Our model includes three-steps: screening and risk stratification; mental health management, consisting of brief intervention and referral for treatment, as appropriate; and follow-up and continuous surveillance (Fig. 2). Screening and risk stratification were based on the two-step process. The brief interventions for mental health management included psychoeducation, lifestyle modification, self-help methods, referrals to medical services, and recommendations for follow-up. A detailed description of each step is provided below.

#### *Screening and risk stratification*

Employees will complete the screening mental health scales, via a mobile application, for the five areas of mental health assessed: insomnia, depression, anxiety, problematic alcohol use, and suicidal risk. Employees are required to complete the scales regularly for surveillance purposes. Prior to each scale, a short script is provided to explain the mental health area being evaluated. As previously mentioned, to enhance the completion rate, a two-step process was used: screening and risk stratification (Fig. 2A). Short-form versions of the scales are first completed for screening. In the case of a positive screen, the participant is asked to complete the long-form version of the scale for a more precise evaluation and risk stratification.

For risk stratification, participants are classified into one of the following four severity groups, based on the scale score obtained: normal, mild, moderate, or severe. For easier and more intuitive communication of the severity classification, we used green, yellow, orange, and red lights for the normal, mild, moderate, and severe classifications. A negative screen is considered a 'normal' classification. Risk classification of a positive screen was based on established severity scores, but with the multidisciplinary team making some adjustments for the evaluation of depression, problematic alcohol use, and suicidal risk. The original developers of the scales used for depression and problematic alcohol use recommended 'five' and 'three' categories of severity, respectively. To align with the universal classification used for risk stratification in our systems (mild severity/yellow light, moderate/orange light, and severe/red light), 'moderately severe' and 'severe' classifications of depression were grouped as severe (red light), while for alcohol consumption, hazardous drinking was classified as mild (yellow light) and alcohol dependence as 'moderate' (orange light). For suicidality, experts on our team agreed that any participants who scored higher than the normal group would be classified as being at a 'severe' risk (red light), ensuring that these participants receive the highest attention and are referred to psychiatric specialists. Table 2 summarizes the scales used in the first and second steps and the adjusted cut-off values for each scale.

#### *Brief intervention and referral to treatment*

For each participant, recommendations for management are distributed in a stepped-wise manner according to the severity classification of mental health problems identified. Recommendations consists of brief interventions and referrals to psychiatrists. Brief interventions included psychoeducation to increase participants' insight and awareness of the mental health issue and self-help methods and lifestyle modifications. Educational materials are primarily distributed automatically through mobile applications, with sessions scheduled with an occupational health manager for discussion. The recommended process

**Table 2.** Name of scales used for the two-step evaluation process of mental health problems and their cut-off values

| Mental health problems  | Name of the scales    | Cut-off value | Name of the scales | Normal | Mild  | Moderate | Severe |
|-------------------------|-----------------------|---------------|--------------------|--------|-------|----------|--------|
| Insomnia                | ISI-3                 | ≥ 4           | ISI-K              | ≤ 7    | 8–14  | 15–21    | 22–28  |
| Depression              | PHQ-2                 | ≥ 3           | PHQ-9              | ≤ 4    | 5–9   | 10–14    | 15–27  |
| Anxiety                 | GAD-2                 | ≥ 3           | GAD-7              | ≤ 4    | 5–9   | 10–14    | 15–21  |
| Problematic alcohol use | Brief AUDIT-K         | ≥ 5           | AUDIT-K            |        |       |          |        |
|                         |                       |               | Male               | ≤ 9    | 10–19 | ≥ 20     |        |
|                         |                       |               | Female             | ≤ 5    | 6–9   | ≥ 10     |        |
| Suicidal Risk           | Suicide item of PHQ-9 | ≥ 1           | MINI               | 0      |       |          | ≥ 1    |

ISI = Insomnia Severity Index, PHQ = Patient Health Questionnaire, GAD = Generalized Anxiety Disorder, AUDIT-K = Korean version of the Alcohol Use Disorders Identification Test, ISI-K = Korean version of the Insomnia Severity Index, MINI = Mini International Neuropsychiatric Interview.

for brief interventions and referrals to treatment for each severity classification is shown in **Fig. 2B** for each mental health problem. Briefly, more comprehensive psychoeducational materials and sessions with an occupational health manager are provided to individuals with a higher severity classification. Referral to treatment is recommended for the orange light (moderate) or red light (severe) classification groups, as the lower cut-off values for the orange group match the cut-off values for the diagnosis of disorders. A detailed description of these recommendations is provided in **Table 3**.

*Recommendations for follow-up*

The schedule of follow-up was also determined according to the severity of mental health problems, with a follow-up recommended at six months for the green light classification, three months for the yellow light classification, and one month for the orange and red light classifications (**Fig. 2, Table 3**). At the pre-specified follow-up schedule, the mobile application automatically notifies the employee to complete the full version of the scale for the specific mental health problem. For example, when a participant was classified into the orange light (moderate) group for a sleep problem, the participant is asked to complete the ISI-K after one month. The intervention is repeated according to the results of the follow-up evaluation.

**Table 3.** Summary of recommendations provided for each severity group

| Severity group    | Brief interventions <sup>a</sup>   | Referral            | Schedule of follow-up |
|-------------------|--|---------------------|-----------------------|
| Green (normal)    | Online psychoeducation <ul style="list-style-type: none"> <li>• Simple information on specific problems</li> <li>• Awareness of mental health problems</li> <li>• Promoting adherence to a healthy lifestyle</li> </ul>  |                     | 6 mon                 |
| Yellow (mild)     | Online psychoeducation <ul style="list-style-type: none"> <li>• Detailed information on specific problems               <ul style="list-style-type: none"> <li>- Insight</li> <li>- Treatment options</li> </ul> </li> <li>• Self-help methods               <ul style="list-style-type: none"> <li>- Sleep hygiene</li> <li>- Relaxation technique</li> <li>- Emergency call numbers</li> </ul> </li> </ul> Sessions with occupational health managers (after two consecutive evaluations) <ul style="list-style-type: none"> <li>• How to promote better lifestyle factors</li> <li>• How to practice self-help methods</li> </ul> |                     | 3 mon                 |
| Orange (moderate) | Sessions with occupational health managers (within 1 wk) <ul style="list-style-type: none"> <li>• Possible treatment options</li> <li>• Importance of getting treatment</li> <li>• Treatment compliance in follow-up sessions</li> </ul>   | Recommended         | 1 mon                 |
| Red (severe)      | Sessions with occupational health managers (as soon as possible)   | As soon as possible | 1 mon                 |

<sup>a</sup>Brief interventions for the higher severity group includes those of lower severity groups.

## DISCUSSION

Herein, we described a new SBIRT-based occupational mental health management system to screen for mental health problems among employees, combined with risk stratification, intervention, and follow-up. The system was based on results from an epidemiological survey which provided an overview of the prevalence of insomnia, depression, anxiety, problematic alcohol use, and suicidal risk in a group of 346 employees. For ease-of-application, accessibility and enhanced adherence, the system was implemented on a web platform with a smartphone application.

Our epidemiological survey did identify that mental health problems are prevalent among employees within workplaces under the occupational management service of Wonju Severance Christian Hospital. Our findings are consistent with the prevalence previously reported for a general population in South Korea, using the same measures and cut-off points as in our study: a prevalence of 10.7% for insomnia and 4.3–6.1% for depression.<sup>31,32</sup> Although we were not able to find studies using same measures, a prevalence of 12.2% for alcohol use disorder and 9.3% for anxiety has been reported.<sup>33</sup> Our lower prevalence of anxiety (4.3%) compared to the 9.3% prevalence previously reported<sup>33</sup> might reflect differences in criteria used for the diagnosis,<sup>34</sup> indicating the need for further attention to identify whether the cut-off value for anxiety needs to be adjusted. Overall, the prevalence of mental health problems identified in our epidemiological survey and previous studies underline the need for management of mental health in workplaces to avoid the decrease in productivity and other social consequences of mental health problems.

Our epidemiological survey also showed that the two-step evaluation process we used, namely screening first using short-form of selected scales and the use of long-form versions based on risk stratification enhances employee adherence while ensuring diagnostic value. While research on the two-step process is scarce, a recent meta-analysis did report that using the short-form PHQ-2 and long-form PHQ-9 in combination resulted in better accuracy while significantly reducing the need to answer the long-form.<sup>35</sup> In our study, the two-step process significantly reduced the number of items employees needed to answer, with only 12 items for the first screening step, while also maintaining its diagnostic value. Moreover, the risk stratification by severity remained relatively stable when using the two-step process, compared to the one-step process. We do note that most disagreements between two processes occurred between the lowest and second lowest severity groups (green and yellow light classification), identifying the need for further research to determine optimal cut-off values for short-form versions of scales and the clinical significance of these cut-offs. Although digital psychiatric interventions do have certain beneficial characteristics with promising results having been shown, adherence to recommendations on a digital platform is an obstacle.<sup>36,37</sup> As screening is the first step for an individual to engage with the SBIRT model, it is crucial that employees complete their regular surveillance. Although further research is warranted, we postulate that reducing the burden of answering unnecessary items by using short-form versions of selected scales in the two-step evaluation process can enhance adherence to regular surveillance.

We expect that our new SBIRT-based intervention will be beneficial to employees. Although more evidence is needed for areas other than problematic substance use, the SBIRT model include several components that can help manage mental health problems. First, through regular surveillance, the model enables early detection of mental health problems, a benefit

that has long been emphasized.<sup>38</sup> Studies have shown that the duration of untreated illness is related to the clinical outcomes of psychiatric diseases.<sup>39,40</sup> In line with these studies, a model intended for early detection and feedback has also shown positive results in occupational health.<sup>19</sup> Second, brief interventions, including psychoeducation, can help employees manage their mental health problems. Our intervention provided various psychoeducational materials that targeted improving insight, awareness of symptoms, and better management of mental health problems. Although psychoeducation is a simple and cost-effective option, it is often deemed ineffective. However, meta-analyses have shown psychoeducation to be an effective treatment option, even when limited to passive and not adjunctive to other treatments.<sup>41,42</sup> Moreover, brief interventions included in our model included improving employees' mental health literacy. Presenting information on mental health problems before answering scales for the surveillance improves employees' mental health literacy to facilitate help-seeking behavior and enables recognition of coworkers' symptoms, leading to early identification and intervention,<sup>43</sup> even for those who do not have a positive screen. Third, our model includes referral to treatment based on risk stratification, intended to decrease the chance of delaying comprehensive care by promptly recommending a referral to a psychiatrist for employees with significant symptoms. Finally, the pre-defined schedule of follow-up for regular screening of mental health symptoms provides continuous management. To our knowledge, most studies focused on a single administration of the intervention and did not consider how the follow-up should be performed. Insufficient maintenance of treatment effects has been reported in previous studies.<sup>12</sup> Considering that common mental disorders relapse, employees can benefit from the continuous surveillance and management of mental health problems.

Easy implementation is an important characteristic of our intervention. Mental health interventions that require additional staff can increase the cost to a company, which can be a barrier to implementation. Through automatic screening of at-risk populations and the management of mild symptoms with psychoeducational materials, human resources can be efficiently allocated to employees with severe symptoms. Therefore, our proposed intervention is intended to be run by a minimal number of staff members. For countries where appointing occupational health managers is mandated by law for most types of businesses, we expect that our intervention can be implemented by occupational health managers, regardless of their specialties. Moreover, automation of the screening process and distribution of psychoeducational materials using digital technologies brings additional benefits to employees, such as improved accessibility and reduced feelings of stigmatization, as previously reported.<sup>44</sup> Therefore, by using personal electronic devices, employees can easily access mental health scales and review psychoeducational materials while feeling less stigmatized regarding their mental health problems.

In addition to the two-step evaluation process, human contact embedded in the intervention is also expected to enhance adherence to the intervention. Although there are conflicting reports and further studies are needed,<sup>45</sup> some studies have demonstrated the beneficial effect of human support on adherence.<sup>46,47</sup> Therefore, by scheduling frequent sessions with occupational health managers for employees with higher severity of mental health problems, adherence to recommendations and possibly referral to psychiatric treatment can be enhanced.

Currently, recruitment for a short-term pilot study to evaluate the feasibility and preliminary effectiveness of our intervention system has begun. Following completion of the pilot study, a pragmatic trial is planned to evaluate the effectiveness and feasibility of the intervention.

In contrast to a general explanatory study, a pragmatic study is a useful method to measure benefits in real-life clinical settings.<sup>48</sup> Considering that adherence and real-life application are known limitations of digital mental health interventions,<sup>12</sup> the authors expect that examining the effectiveness rather than efficacy of the intervention will provide more useful evidence regarding its real-life application.

For the pragmatic trial, a large population of workers residing in Gangwon Province, South Korea, will be recruited. Eligible participants will be the nearly 12,000 workers across the 150 companies participating in the occupational health management service of Wonju Severance Christian Hospital. Participants who agree to participate in the trial will be randomly assigned to either the intervention or the control group. Outcomes evaluated will include mental health scores on scales used, as well as assessment of quality of life and overall distress and of adherence, and satisfaction with the intervention.

The limitations of our study should also be considered. First, although digital therapeutics generally provides greater accessibility, those who are not familiar with digital devices might have trouble using the intervention. Surveillance and brief psychoeducation, which are core features of our intervention, were accessed through smartphone applications. Therefore, sufficient time should be spent on educating employees to familiarize themselves with the smartphone application. Second, the results of the two-step evaluation process were derived from the responses to long forms of the mental health scales used. The possibility that individuals might respond differently according to the order of the items cannot be ruled out. Therefore, these results should be cautiously interpreted.

In conclusion, we present a new model for the management of occupational mental health. The model, developed by a multidisciplinary team, is expected to provide an effective management of employees' mental health. The intervention was designed for convenient implementation and to enhance employee adherence and assist occupational health managers in providing continuous management. Further studies are needed to examine the effectiveness and feasibility of the proposed intervention. Trials should also include outcome parameters evaluating adherence, quality of life, and client satisfaction with the intervention.

## SUPPLEMENTARY MATERIALS

### Supplementary Table 1

Problematic alcohol use among employees by severity (N = 346)

[Click here to view](#)

### Supplementary Table 2

Mental health problems (insomnia, anxiety, suicidal risk) among employees by severity (N = 346)

[Click here to view](#)

### Supplementary Table 3

Depression among employees by severity (N = 346)

[Click here to view](#)

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