

An AI-Driven Workflow Synchronizing Interdisciplinary Dentistry

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Introduction

Effective treatment planning in dentistry should be both concise and comprehensive. The integration of artificial intelligence (AI) into dental technology has recently streamlined the decision-making processes, simplifying treatment planning for clinicians [1]. AI has the potential to improve coordination among different dental specialists involved in a case. Currently, no clearly defined Interdisciplinary workflow exists.

AI is a computer-based system used in dentistry to support clinical decision-making. One of its key branches is machine learning [2], which uses trained models to recognize patterns and continually improve itself through experience. This continuous learning enables AI-driven dental software to make increasingly accurate predictions [3]. Advanced 3D imaging devices in dentistry, such as intraoral scanners (IOS), cone-beam computed tomography (CBCT), facial scanners (FS), and jaw motion tracker (JMT), can be integrated with AI-powered software to predict treatment outcomes. This thereby improves treatment efficiency and prognosis [4].

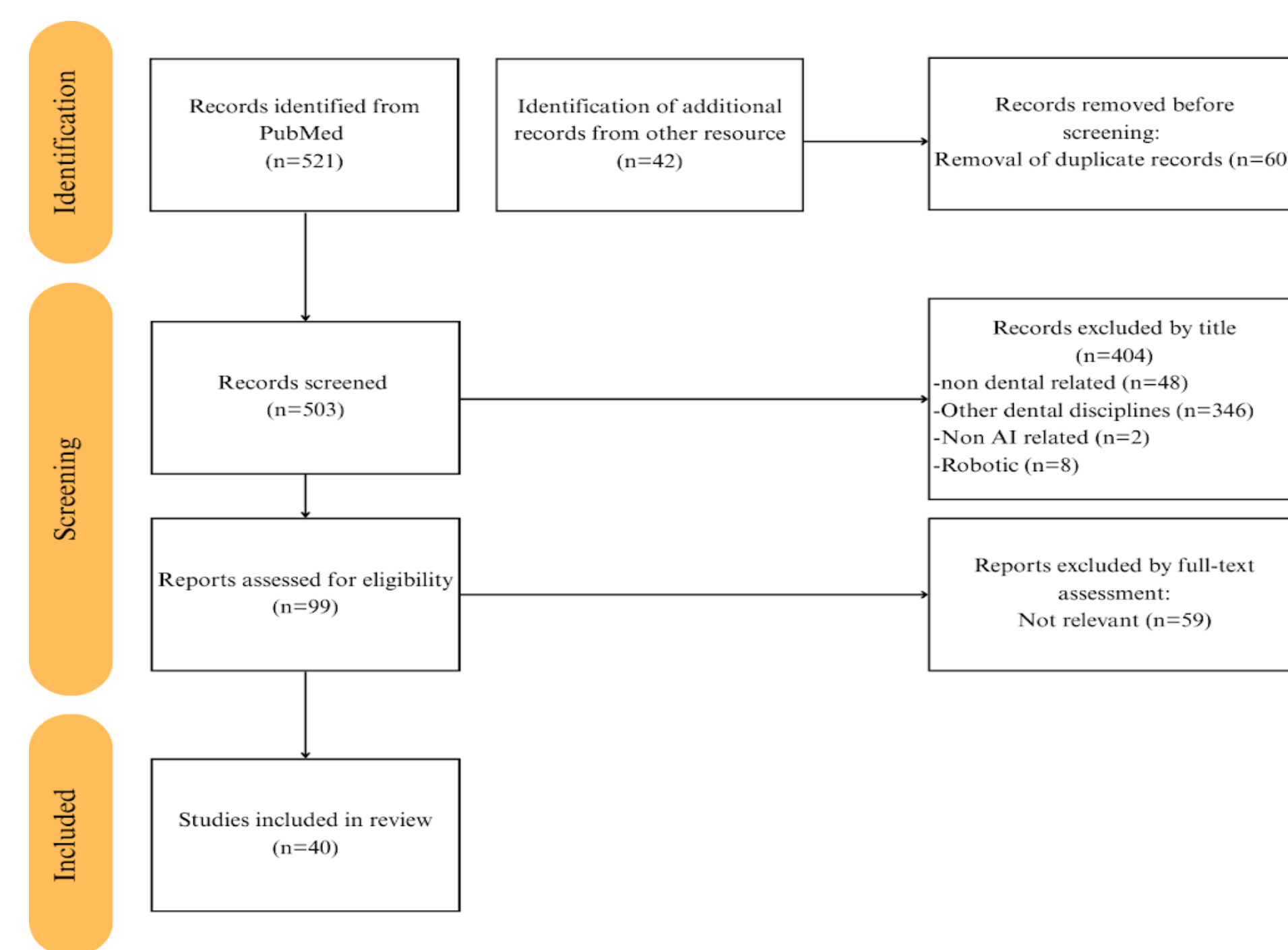


Fig 1. PRISMA Flow diagram of study selection phases

Study Selection

All studies selected for the literature review were extracted from the PubMed database. The total number of studies selected for the review was 40. Of the 40, 24 were utilized for general information, while 16 were cited for their statistics in the accuracy of AI software within data acquisition, treatment planning, and clinical implementation (Figure 1).

Results

Phase 1: Data acquisition

Studies have shown that creating a virtual patient using IOS, CBCT, FS, and JMT provides greater accuracy compared to traditional analog impression [5] (Figure 2). The accuracy of FS has been reported to be within < 0.6 mm across all systems [6], while virtual articulators have demonstrated deviations of less than $100 \mu\text{m}$ from mechanical articulators [7]. This high level of precision is consistent across multiple dental disciplines – for example, 88.3% in radiology [8], 83-96% in periodontics [9], 95% in prosthodontics [10], and 97.8% in orthognathic surgery [11].

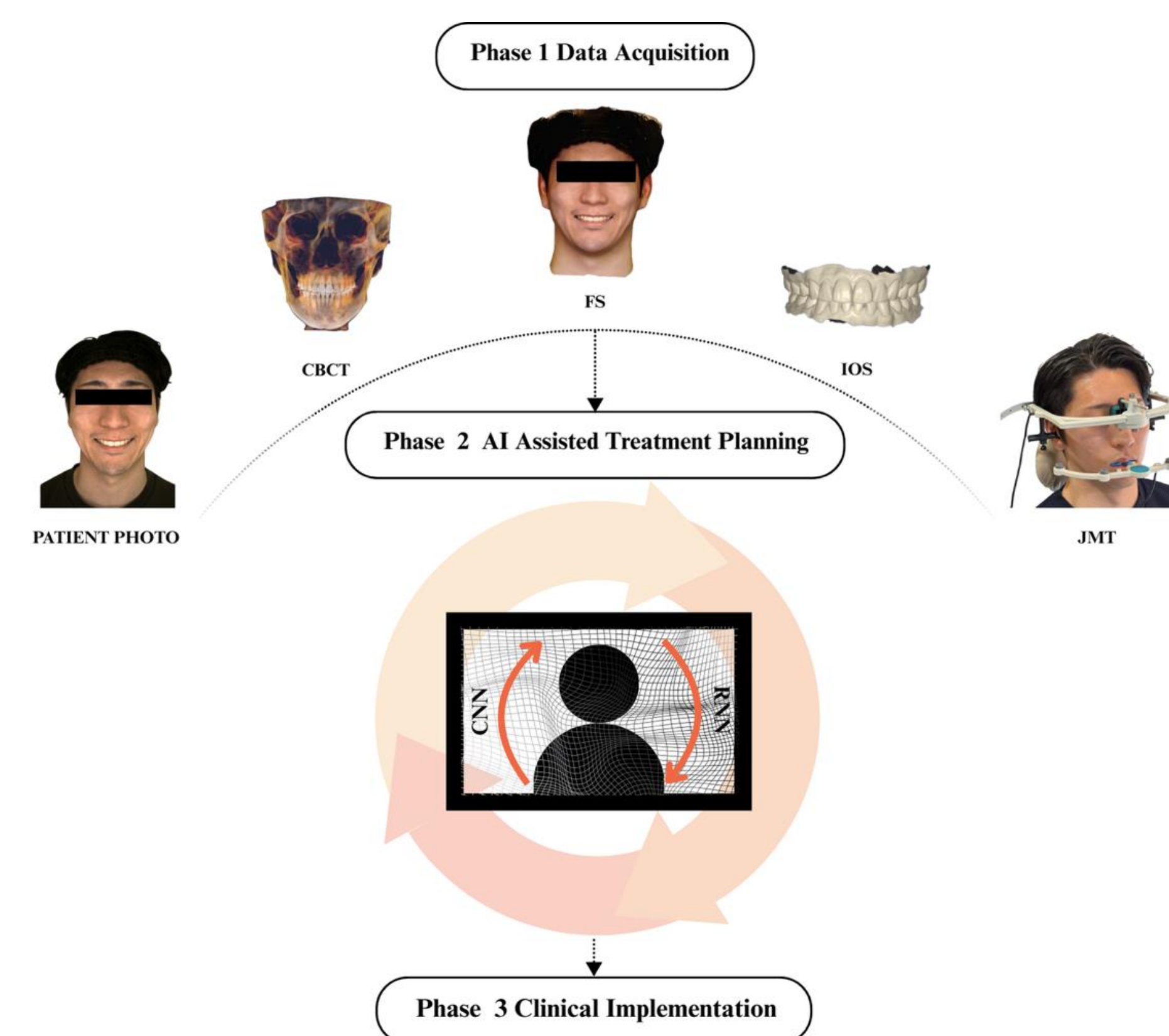


Fig 2. AI-assisted synchronizing ecosystem

Phase 2: Treatment planning and Phase 3: Clinical implementation

Studies have shown that CNNs and RNNs improve clinician decision-making with high acceptance rate across disciplines: over 80% in aesthetics dentistry [12,13], 95.8% accuracy in detecting carious lesion on radiograph [14,15], 89.6% in detecting periapical periodontitis, 93% in periodontal therapy, and 75-84% in predicting tooth prognosis [2,16-17] (Fig 2). AI support has also shown 87% accuracy in orthodontic extraction decision-making and up to 98% accuracy in predicting clear aligner outcomes [18-19], as well as 95% accuracy in designing removable prosthetics with clinically acceptable provisional edentulous prostheses using digital workflow in comparison to conventional design [13].

Conclusion

This literature review presents a novel interdisciplinary workflow that can be applied to the majority of dental professionals. By integrating IOS, CBCT, FS, and JMT, a comprehensive virtual patient can be created to facilitate seamless communication and effective treatment planning (Figure 3). This AI-integrated workflow enhances diagnostic accuracy, treatment efficiency, and transparency among dental practitioners, ultimately improving patient outcome and satisfaction.

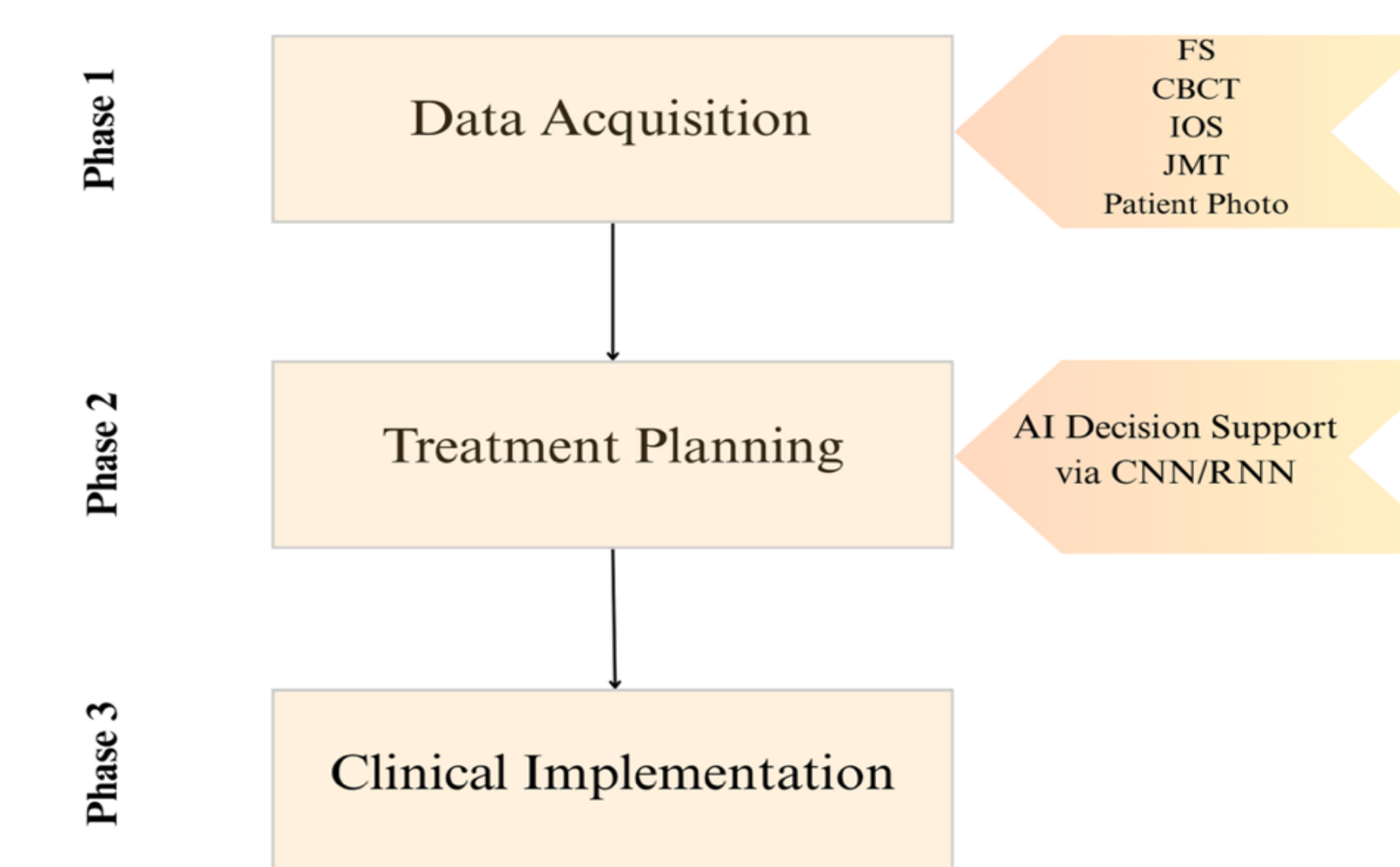


Fig 3. Synchronizing workflow

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