CLAIMS

1. A method, comprising:

determining, via a processor, a sagittal acetabular cup position in the form of a standing Anteinclination (AI), a seated AI and a SacroAcetabular Angle (SAA) based on at least one of (i) a standing sacral slope (SS) of a first patient relative to a normative SS, (ii) a delta of the sacral slope (dSS) of the first patient between a standing position of the first patient and an upright seated position of the first patient, (iii) a femoral version of the first patient, when the femoral version corresponds to a femoral version outlier position, and (iv) a pelvic femoral angle (PFA) of the first patient that corresponds to a PFA outlier position in at least one of the standing position, the upright seated position, or a delta between the standing position and the upright seated position;

determining, via the processor, a coronal acetabular cup position in the form of a supine coronal anteversion and at least one of a supine or a standing coronal inclination and anteversion based on the sagittal acetabular cup position; and

determining, via a processor, a post-operative standing AI and a post-operative seated AI based on at least the coronal acetabular cup position.

2. The method of claim 1, further comprising:

sending, via the processor, at least one of the sagittal acetabular cup position and the coronal acetabular cup position to a remote processor electrically coupled to at least one of a preoperative templating apparatus or a navigation device.

3. The method of any one of claims 1-2, wherein the processor is electrically coupled to at least one of a preoperative templating apparatus or a navigation device.

4. The method of any one of claims 1-3, further comprising:

receiving, via the processor, a plurality of biomechanical values comprising a pelvic incidence (PI), the sacral slope (SS), a pelvic tilt (PT), the delta of the sacral slope (dSS), the pelvic femoral angle (PFA), a leg length, a hip offset, a hip center of rotation, and the femoral version based on images of the first patient.

5. The method of claim 4, wherein receiving, via the processor, the plurality of biomechanical values comprising the pelvic incidence (PI), the sacral slope (SS), the pelvic tilt (PT), the delta of the sacral slope (dSS), the pelvic femoral angle (PFA), the leg length, the hip offset, the hip center of rotation, and the femoral version based on the images of the first patient comprises:

receiving, via the processor, one or more digitized voice commands that include one or more of the plurality of biomechanical values.

6. The method of claim 5, wherein the processor is electrically coupled to an audio-digital converter configured to digitize the one or more voice commands.

7. The method of claim 4, wherein receiving, via the processor, the plurality of biomechanical values comprising the pelvic incidence (PI), the sacral slope (SS), the pelvic tilt (PT), the delta of the sacral slope (dSS), the pelvic femoral angle (PFA), the leg length, the hip

offset, the hip center of rotation, and the femoral version based on the images of the first patient comprises:

receiving, via the processor, one or more signals from a user input module, wherein the one or more signals include one or more of the plurality of biomechanical values.

8. The method of any one of claims 1-7, further comprising:

determining or receiving, via the processor, a plurality of biomechanical values comprising a pelvic incidence (PI), the standing sacral slope (SS), a pelvic tilt (PT), the delta of the sacral slope (dSS), the pelvic femoral angle (PFA), a leg length, a hip offset, a hip center of rotation, and the femoral version based on one or more images comprising the first patient showing a standing lateral view from an L1 lumbar vertebra to an upper fifth of a femur, a seated lateral view from the L1 lumbar vertebra to the upper fifth of the femur, a standing anteroposterior (AP) pelvis view, an AP view of a hip, a lateral view of the hip and a modified Budin view.

9. The method of any one of claims 1-8, wherein further comprising:

providing, via at least one of a display or an audio-digital converter, intraoperative guidance or control of a navigation device based on at least one of the sagittal acetabular cup position and the coronal acetabular cup position.

10. The method of claim 9, wherein determining the post-operative standing AI and the post-operative seated AI based on at least the coronal acetabular cup position comprises tracking, via the processor, anatomy of the first patient and the acetabular cup in real-time,

wherein a plurality of sensors are coupled to one or more of the acetabular cup, the anatomy of the first patient and the navigation device and the plurality of sensors are electrically coupled to the processor.

11. The method of any one of claims 9-10, wherein the audio-digital converter is configured to permit two-way communication between a surgeon and the processor.

12. The method of any one of claims 9-11, further comprising:

providing, via the display, images showing a spatial position and an orientation of the acetabular cup in real-time.

13. The method of claim 12, further comprising:

determining, via the processor, an orientation of a femoral component.

14. The method of any one of claims 1-13, further comprising:

registering, via the processor, anatomy of the first patient to an OR table.

15. The method of claim 14, further comprising:

synchronizing, via the processor, the registered anatomy of the first patient to a treatment path of a robotic arm of a navigation device and to at least one of the sagittal acetabular cup position and the coronal acetabular cup position.

16. The method of any one of claims 1-15, further comprising:

after implanting an acetabular cup in the first patient, confirming, via a localization device, a plurality of placement parameters in a plurality of planes.

17. The method of any one of claims 1-16, further comprising:

after implanting an acetabular cup in the first patient, measuring, via a localization device, changes in a post-operative state relative to a pre-operative state.

18. The method of any one of claims 1-17, further comprising:

determining, via the processor, at least one recommendation for a type of implant, a treatment plan or a surgical tip based on historical data from a plurality of patients, wherein the historical data comprises a plurality of coronal acetabular cup positions, a plurality of coronal or sagittal biomechanical values and measured changes in a post-operative state relative to a pre-operative state; and

providing the at least one determined recommendation, via at least one of a display or audio-digital converter, to a surgeon.

19. The method of any one of claims 1-18, further comprising:

storing, via the processor, data associated with the first patient, the data comprising the coronal acetabular cup position, a plurality of coronal or sagittal biomechanical values and measured changes in a post-operative state relative to a pre-operative state.

20. A non-transitory computer-readable medium having stored thereon program instructions that upon execution by a processor, cause performance of a method comprising:

the processor determining a sagittal acetabular cup position in the form of a standing Anteinclination (AI), a seated AI and a SacroAcetabular Angle (SAA) based on at least one of (i) a standing sacral slope (SS) of a first patient relative to a normative SS, (ii) a delta of the sacral slope (dSS) of the first patient between a standing position of the first patient and an upright seated position of the first patient, (iii) a femoral version of the first patient, when the femoral version corresponds to a femoral version outlier position, and (iv) a pelvic femoral angle (PFA) of the first patient that corresponds to a PFA outlier position in at least one of the standing position, the upright seated position, or a delta between the standing position and the upright seated position;

the processor determining a coronal acetabular cup position in the form of a supine coronal anteversion and at least one of a supine or a standing coronal inclination and anteversion based on the sagittal acetabular cup position; and

the processor determining a post-operative standing AI and a post-operative seated AI based on at least the coronal acetabular cup position.

~~21. The non-transitory computer-readable medium of claim 20, wherein the method further comprises:~~

~~the processor sending at least one of the sagittal acetabular cup position and the coronal acetabular cup position to a remote processor electrically coupled to at least one of a preoperative templating apparatus or a navigation device.~~

~~22. The non-transitory computer-readable medium of any one of claims 20-21, wherein the method further comprises:~~

the processor receiving a plurality of biomechanical values comprising a pelvic incidence (PI), the sacral slope (SS), a pelvic tilt (PT), the delta of the sacral slope (dSS), the pelvic femoral angle (PFA), a leg length, a hip offset, a hip center of rotation, and the femoral version based on images of the first patient.

23. The non-transitory computer-readable medium of claim 22, wherein the processor receiving the plurality of biomechanical values comprising the pelvic incidence (PI), the sacral slope (SS), the pelvic tilt (PT), the delta of the sacral slope (dSS), the pelvic femoral angle (PFA), the leg length, the hip offset, the hip center of rotation, and the femoral version based on the images of the first patient comprises:

the processor receiving one or more digitized voice commands that include one or more of the plurality of biomechanical values.

24. The non-transitory computer-readable medium of claim 23, wherein the processor is electrically coupled to an audio-digital converter configured to digitize the one or more voice commands.

25. The non-transitory computer-readable medium of claim 22, wherein the processor receiving the plurality of biomechanical values comprising the pelvic incidence (PI), the sacral slope (SS), the pelvic tilt (PT), the delta of the sacral slope (dSS), the pelvic femoral angle (PFA), the leg length, the hip offset, the hip center of rotation, and the femoral version based on the images of the first patient comprises:

the processor receiving one or more signals from a user input module, wherein the one or more signals include one or more of the plurality of biomechanical values.

26. The non-transitory computer-readable medium of any one of claims 20-25, wherein the method further comprises:

the processor determining or receiving a plurality of biomechanical values comprising a pelvic incidence (PI), the standing sacral slope (SS), a pelvic tilt (PT), the delta of the sacral slope (dSS), the pelvic femoral angle (PFA), a leg length, a hip offset, a hip center of rotation, and the femoral version based on one or more images comprising the first patient showing a standing lateral view from an L1 lumbar vertebra to an upper fifth of a femur, a seated lateral view from the L1 lumbar vertebra to the upper fifth of the femur, a standing anteroposterior (AP) pelvis view, an AP view of a hip, a lateral view of the hip and a modified Budin view.

27. The non-transitory computer-readable medium of any one of claims 20-26, wherein the method further comprises:

at least one of a display or an audio-digital converter providing intraoperative guidance or control of a navigation device based on at least one of the sagittal acetabular cup position and the coronal acetabular cup position.

28. The non-transitory computer-readable medium of claim 27, wherein the processor determining the post-operative standing AI and the post-operative seated AI based on at least the coronal acetabular cup position comprises the processor tracking anatomy of the first patient and

~~the acetabular cup in real-time, wherein a plurality of sensors are coupled to one or more of the acetabular cup, the anatomy of the first patient and the navigation device and the plurality of sensors are electrically coupled to the processor.~~

~~29. The non-transitory computer-readable medium of any one of claims 27-28, wherein the audio-digital converter is configured to permit two-way communication between a surgeon and the processor.~~

~~30. The non-transitory computer-readable medium of any one of claims 27-29, wherein the method further comprises:~~

~~the display providing images showing a spatial position and an orientation of the acetabular cup in real-time.~~

~~31. The non-transitory computer-readable medium of claim 30, wherein the method further comprises:~~

~~the processor determining an orientation of a femoral component.~~

~~32. The non-transitory computer-readable medium of any one of claims 20-31, wherein the method further comprises:~~

~~the processor registering anatomy of the first patient to an OR table.~~

~~33. The non-transitory computer-readable medium of claim 32, wherein the method further comprises:~~

the processor synchronizing the registered anatomy of the first patient to a treatment path of a robotic arm of a navigation device and to at least one of the sagittal acetabular cup position and the coronal acetabular cup position.

34. The non-transitory computer-readable medium of any one of claims 20-33, wherein the method further comprises:

after implanting an acetabular cup in the first patient, a localization device confirming a plurality of placement parameters in a plurality of planes.

35. The non-transitory computer-readable medium of any one of claims 20-34, wherein the method further comprises:

after implanting an acetabular cup in the first patient, a localization device measuring changes in a post-operative state relative to a pre-operative state.

36. The non-transitory computer-readable medium of any one of claims 20-35, wherein the method further comprises:

the processor determining at least one recommendation for a type of implant, a treatment plan or a surgical tip based on historical data from a plurality of patients, wherein the historical data comprises a plurality of coronal acetabular cup positions, a plurality of coronal or sagittal biomechanical values and measured changes in a post-operative state relative to a pre-operative state; and

at least one of a display or audio-digital converter providing the at least one determined recommendation to a surgeon.

~~37. The non-transitory computer-readable medium of any one of claims 20-36, wherein the method further comprises:~~

~~the processor storing data associated with the first patient, the data comprising the coronal acetabular cup position, a plurality of coronal or sagittal biomechanical values and measured changes in a post-operative state relative to a pre-operative state.~~